FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 99
No. 2039
Registered at the G.P.O. as a Newspaper

SEPTEMBER 29, 1955
Offices: John Adam House, John Adam St., London, W.C.2

Single Copy, 9d. By Post 11d. Annual Subscription, Home £2 Abroad £1 5s

UNIV.

OCT 24 1955

EAST ENGINEERING LIBRARY

Because of its toughness and ductility, S.G. Iron piping can be bent on the site, either hot or cold, and lowered into the trench without any risk of breaking. The high strength, machinability and weldability of S.G. Iron are added advantages which ensure better castings for a wide variety of applications in many industries, including mining, railways, marine and road transport.

S.G. Iron (Spheroidal Graphite Iron) is manufactured under licence and is the subject of patents and patent applications in the name of The Mond Nickel Company Limited.

OND NICKEL COMPANY LIMITED. Thames House · Millbank · London · SW1

TGA 21/3K

LLDAYS & ONIONS LTD.

BIRMINGHAM 11

...vers of

...ON FOUNDRY EQUIPMENT

PRICE'S FIREBRICKS

As used by all the leading Iron and Steelworks and Foundries at Home and Abroad

Manufactured by

J. T. PRICE & CO. LTD. STOURBRIDGE

another perfect strip

using

NO. 10 PREPARED BLACKING

Photograph by courtesy of The Manganese Bronze and Brass Co. Ltd.

JAMES DURRANS & SONS LTD

PHŒNIX WORKS & PLUMPTON MILLS, PENISTONE, near SHEFFIELD

Telephone: PENISTONE 21 and 57 Telegrams: BLACKING, PENISTONE

FOUNDRY TRADE JOURNAL

Established 1902

Vol. 99 Thursday, September 29, 1955 No. 2039

Editor:
V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.
Commercial Editor: P. E. CARDEN.
Advertising Manager: LENNOX HOLT, M.I.B.F.
Production Manager: R. J. LOVELL.
Publisher: H. J. DWYER.
Circulation Manager: E. T. GRIFFITHS.

District Representatives:
G. P. ELLIOTT (*Northern Area*)
T. H. SMITH (*Scotland*)

PRINCIPAL CONTENTS

Technical: PAGE

Effect of Mould Material on the Solidification Rate of Cast Metals
Appendices to the Report are recorded, along with a full account of the discussion which took place when the Report was presented to the International Foundry Congress 349

Hot-dip Aluminium Coating for Cast Iron, by Shigetomo Ueda
The Author reviews several methods of hot-dip coating and outlines his own research experiments with a view to restricting sulphurization of iron used in the chemical industry 359

Building in Prefabricated Concrete
Foundry Extensions for Sterling Metals Limited, Nuneaton 363

Features:

Leader: Chance to Modernize . . . 347
New Equipment 365
New Patents 366
Personal and Obituary 370
Forthcoming Events (Advert section) . 33

Commercial:

Conditional Aid Revolving Fund . . 362
Company News 366
Raw Material Markets 372
Current Prices of Iron, Steel and Non-ferrous Metals (Advert section) . . 32

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Weekly

Single copy 9d.; by post 11d.;
Annual subscription: home 40s., abroad 45s. (prepaid)

JOHN ADAM HOUSE,
ADELPHI, LONDON, W.C.2

'Phone: TRAfalgar 6171 (10 lines)
'Grams: Zacatecas, Rand, London.

Chance to Modernize

Elsewhere in this issue* are printed details of a £700,000 loan fund, which has been used extensively by industry. It can be equally well applied by the small- and medium-size foundries for the purpose of increasing productivity—a matter not to be confused with output. We have not published the application form for such loans, but it is so worded that its main provisions are well worth application to any executive's pet plans for raising productive efficiency. The application of the Conditional Aid scheme in the work of the research associations is well known but its extension to industry has not been widely publicised.

The results of the application of loans from the fund would in many cases be profitable. For instance, a master patternmaker could make out a good case for the purchase of a piece of modern machinery, but a foundry owner wishing to experiment on obtaining a higher yield of good castings from the quantity of metal charged into his furnace would have difficulty in preparing an acceptable case. It would certainly be easier to make out a request for a new charging apparatus for his cupola. Yet one cannot with justification find fault with a system which favours plant improvement rather than process amelioration, as staff changes could nullify the latter.

Looking again at "Metal Utilization in the Metal Working Industries"—an excellent pamphlet issued by the Institution of Production Engineers, it shows in several cases how by changing over to castings considerable savings have been effected. Two examples are given where, by the resort to shell moulding, really worth-while reductions in the weight of metal used and machined away have been recorded. It would thus appear that in some cases, where the supply of semi-finished components is involved, then support from the customers would be required when seeking a Revolving Fund loan, for instance, if a founder desired to instal a shell-moulding plant. It is evident from the conditions governing a loan that the applicant must know his existing costs—a precept which we have expressed, *ad nauseum* in this column. We advise our home readers to give careful thought to the opportunities offered, bearing in mind the acquisition of a modern machine is the easiest proposition to put forward. There is still far too much obsolete plant existing in the smaller foundries, the replacement of which would unquestionably reflect favourably on productivity. The old-fashioned method of hand shanking of metal to the moulds can profitably be changed over to a monorail system. There is no end to such cases.

* Page 362.

Tenth I.B.F. Golf Meeting

Woodhall Spa was again the meeting place for the Golfing Society of the Institute of British Foundrymen and the party of approximately 50 were well cared for by the staff of the Golf Hotel during the weekend September 23 to 25. Despite the dry summer the course was in tip-top condition and all enjoyed the annual battle against unlimited hazards. The results of the competition are listed below:

Saturady morning: Stroke competition for the IBF Handicap and Scratch Cup (36 competitors).

1. A. T. Johnson	86 — 17	69	Winner Handicap Cup.
2. H. Oliver	92 — 20	72	Second handicap prize.
3. R. T. Turner	83 — 11	72	Third handicap prize.
4. P. G. Pennington	82 — 9	73	Winner Scratch Cup.
5. G. W. Nicholls	89 — 15	74	
6. W. Jones	87 — 12	75	
7. E. Clipson	99 — 24	75	
8. T. Reynolds	92 — 22	75	
11. R. B. Templeton	91 — 14	77	Winner Veteran Cup.

In addition to holding the Handicap and Scratch Cups for one year, the winners also received a tankard each, kindly presented by Mr. John Bell, immediate past-president of the Institute. The second and third handicap prizes were presented by Mr. E. A. Phillips. The branch Coronation Shield was won by the West Riding of Yorkshire branch's second team—G. Nicholls 74, R. T. Turner 72, F. Webster 79, = 225. The winners also received prizes presented by last year's winners.

Saturday afternoon: Two-ball foursome *v.* bogey.

1. H. Hillman and H. Oliver	4 up.
2. P. B. Higgins and T. Reynolds	2 up.
3. P. G. Pennington and J. W. Lessels	All Square.
4. H. C. Hanson and L. Martlock	1 down.

The winners each received a chromium-plated Lincoln Imp, kindly presented by the Lincolnshire branch of the Institute.

Sunday morning: Four-ball foursomes *v.* bogey.

1. P. G. Pennington and C. H. Wilson	10 up.
2. G. W. Nicholls and P. B. Higgins	5 up.
3. H. Oliver and H. C. Hanson	4 up.
4. R. C. Shepherd and W. Jones	4 up.
5. T. Reynolds and J. Bell	4 up.

The winners received ½ doz. golf balls each, kindly presented by Mr. R. C. Shepherd.

Ladies' Competition—Stapleford. This was held on the Saturday morning when twelve competed for the ladies' Coronation Rose Bowl (challenge).

1. Mrs. E. A. Phillips	32 points.
2. Mrs. W. N. Cook	27 points.
3. Mrs. J. Bell	25 points.

Golf balls were also presented to the winning ladies by Mr. E. A. Phillips.

Annual General Meeting

The president of the Society, Mr. E. A. Phillips, in the chair, opened his remarks at the annual general meeting in the Golf Hotel on Saturday evening by welcoming members and their ladies, and in particular Mr. John Bell, the immediate past-president of the Institute, who had undertaken a long journey to be present, and also Mr. John Williams, senior vice-president of the Institute, who had also considerable travelling to do. Mr. Phillips expressed his sorrow that a number of regular members were prevented from attending, due to health or duty reasons and hoped that all would be able to be present next year.

During the meeting, the following officers were elected or confirmed in office: As president—Mr. E. A. Phillips; as vice-presidents—Mr. V. C. Faulkner, Mr. R. C. Shepherd, Mr. R. B. Templeton; as committee—

(*Continued at the foot of col.* 2)

Mr. L. Mortlock, Mr. W. W. Cook, Mr. C. H. Wilson, Mr. G. W. Nicholls, and as hon. secretary, Mr. P. G. Pennington. Mr. Phillips called upon Mr. John Bell to present the prizes, afterwards extending to Mr. Bell the thanks of all members for his presence during the meeting. Next year's meeting is to be held at Woodhall Spa, on September 29 and 30.

Vickers-Armstrongs' Appointments

Mr. W. D. Opher, at present a director of Vickers-Armstrongs (Engineers), Limited, and general manager of the North-Eastern Works of that company, will join the boards of the parent company, Vickers-Armstrongs, Limited, and of Vickers-Armstrongs (Shipbuilders), Limited, on October 24. He will take over the office of deputy managing director of Vickers-Armstrongs (Engineers) and will also become general manager of the Barrow works in place of Mr. Francis P. Laurens, who has been appointed managing director of Powers-Samas Accounting Machines, Limited (a subsidiary of Vickers, Limited), as from the same date. Mr. Laurens will resign his seat on the board of Vickers-Armstrongs (Shipbuilders), but will remain a director of Vickers-Armstrongs.

The position of general manager of the North-Eastern Works is to be vacated by Mr. Opher and filled by Mr. A. P. Wickens. He, in turn, is to be succeeded by Mr. J. R. Hendin as manager, industrial tractors, at the Scotswood works of Vickers-Armstrongs (Engineers). Mr. Robert Wonfor, at present managing director (sales, finance, and research) of Powers-Samas Accounting Machines, will relinquish that office on October 24 when he will be appointed a special director of Vickers-Armstrongs (Engineers) on taking over the duties of Mr. Hendin as joint manager, engineering sales departments. Mr. Wonfor will relinquish his seats on the boards of Powers-Samas Accounting Machines and its subsidiary companies.

Meeting of Past Presidents

Last Saturday, at the house of the *Association Technique de Fonderie*, in Paris, there was a very full meeting of the past-presidents of the International Committee of Foundry Technical Associations. Mr. Y. Granström of Sweden presided. There were present Mr. M. Vuillemier (vice-president) (Switzerland), Mr. A. Brizon (France), Mr. V. Delport (USA), Mr. R. Duprez (Belgium), Mr. V. C. Faulkner (Great Britain), Mr. Léonard (Belgium) and Mr. F. W. E. Spies (Holland). Mr. G. Lambert (Great Britain) attended as honorary secretary of the International Committee. After the meeting, the committee were entertaind to luncheon by Mr. G. Rivoire, the president of the French *Association*.

GIFA

These initials will become well known during the next twelve months as they stand for the International Foundry Exhibition to be held in Düsseldorf from September 1 to 9, 1956. Any firms interested in taking space should write for a pamphlet covering the conditions to "Gifa," Internationale Giesserei-Fachmesse, 4 Ehrenhof, Düsseldorf, Germany.

Postponed Meeting. As the meeting of the West Wales section, Wales and Monmouth branch, of the Institute of British Foundrymen, scheduled for October 7, clashes with National Works Visits Day, it has been postponed. The new date is Friday, October 14; the meeting will be at Swansea, and I. Rees and D. V. Atterton will lecture on the CO_2 Process.

Effect of Mould Material on the Solidification Rate of Cast Metals*

Report of IBF Sub-committees T.S. 21, 33 and 46† and Discussion.

(*Continued from page* 339)

APPENDIX A

Methods Used for Slush-casting Experiments

The apparatus used for the slush-casting experiments is shown in Figs. 25 and 26. Two shapes of mould were used—cylindrical and rectangular. The cylindrical mould was rammed by dropping a constant weight through a fixed distance on to a measured volume of sand. The rectangular mould was manually rammed with great care to obtain an evenly-rammed mould from test to test. This rammed mould rested on the core "B," Fig. 25, the metal being poured through the tundish core "C." At a measured time-interval after casting, the mould was lifted, allowing the residual molten metal to run out. It was found that only a comparatively thin shell can be obtained in this way because the solid crust formed at the bottom of the core interferes with the slushing-out process.

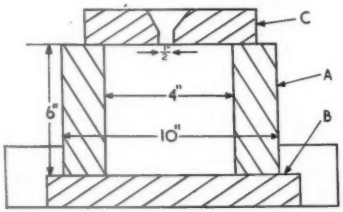


FIG. 25.—*Diagrammatic section through the mould used in slush-casting experiments.*

In order to obtain solidification from the mould wall, the bottom core "B" was replaced by an arrangement shown in Fig. 27. An insulating brick protected with refractory cement was preheated to from 400 to 500 deg. C. and placed in an iron ring, the space between the ring and the brick being filled with foundry sand. The pouring funnel was also made in a refractory material and was preheated to minimize solidification at the top surface of the metal. This arrangement was used throughout the subsequent work.

The following procedure was adopted with the apparatus: the metal was melted and superheated to a controlled temperature in a high-frequency furnace, the temperature being measured with an immersion thermocouple. The metal was poured at 1,250 deg. C., the slushing times being measured by a stop-watch. The shell obtained was cut in half and its thickness measured by micrometer gauge. When the inner surface of the shell was not smooth, an average of ten thickness readings was taken.

Preliminary Experiments

The two grey irons selected for this work had the following composition:—

High-phosphorus iron.—C, 3.12; Si, 2.80; Mn, 0.5; P, 1.35; and S, 0.07 per cent.

Low-phosphorus iron.—C, 3.2; Si, 2.2; Mn, 0.7; P, 0.19; and S, 0.1 per cent.

Charges containing half cupola remelted pig-iron and half experimental scrap were melted in a high-frequency furnace. The results obtained using the cylindrical mould are shown in Fig. 28, from which it is clear that high-phosphorus iron was the more suitable for slushing experiments. Low-phosphorus iron gives a deeper pasty zone, which interferes with the slushing process.

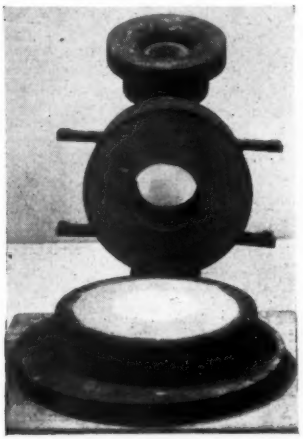


FIG. 26.—*Actual mould used for slush-casting.*

Two difficulties became apparent from these experiments:—(*a*) That even with the high-phosphorus iron, the reproducibility of shell thickness above 0.4-in. was very difficult; the thickness of the shell was very sensitive to any variation in pouring temperature. Even with the accuracy of temperature measurement possible with a Pt-Pt/Rh thermocouple, great scatter in thickness-values was obtained. This was also partly due to the roughness of the inner surface of the cast shell: (*b*) the plotting of results for cylindrical moulds gave points which did not lie in a straight line. This was a

* Presented at the fifty-second annual meeting of the Institute of British Foundrymen and International Foundry Congress in London last June.

† The constitution of the sub-committees was published with the first section of the report on September 15.

serious disadvantage, as it made it impossible to extrapolate the results to obtain the end-point of solidification. In addition, the number of results which had to be obtained to get a reliable graph was unduly large.

Experiments with Non-ferrous Metals

It was decided at this stage to carry out experiments with lower-melting-point alloys to endeavour to establish the cause of the poor reproducibility of results in the thicker shells, and to obtain a more uniform shell-thickness/time relationship. The following metals were used with cylindrical and rectangular moulds:—(1) Super-pure aluminium (99.99 per cent. purity); (2) commercially-pure aluminium (99.5 per cent.); (3) commercial aluminium containing Si 1.7 and 11.6 per cent.; and (4) electrolytic copper. Mould preparations and slushing technique were the same as those used with the grey iron.

The results obtained with the non-ferrous metals confirm the general nature of the results obtained with grey iron. The aluminium alloy containing 1.7 per cent. silicon solidified with a deep pasty mass, gave a rough inner-surface, with poor reproducibility, and was unsuitable for slushing experiments. The alloy containing 11.6 silicon, which was the eutectic composition, did not give as smooth an inner-surface of the shell as was anticipated; super-pure aluminium gave very smooth shells, whilst commercially-pure aluminium ones were considerably rougher. The results are shown in Fig. 29.

In all cases where rectangular moulds were used a straight-line relationship was found when solid-shell thickness was plotted against time. A cylindrical mould used with commercially-pure aluminium gave the same type of graph as obtained with grey iron in the same type of mould, but this graph did not follow a linear relationship for $\sqrt{\text{time}}$ *v* shell thickness. From this it was clear that the rectangular mould was more advantageous, as far fewer experiments were required to establish the slope of the straight line. The graph could then be used for subsequent numerical calculations, such as the calculation of the end point of solidification.

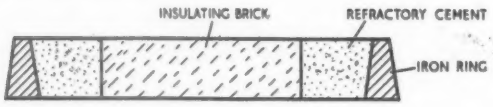
Experiments with Different Moulding Sands

A rectangular mould was, therefore, used in preference to the cylindrical mould for investigating the effect of different moulding sands on the solidification rate of high-phosphorus grey cast-iron. The sand chosen was Bromsgrove red; one half of the mould was rammed up in raw red sand at 6.5 per cent. moisture, and the other half in the same sand with 8 per cent. coal-dust added, the moisture being kept at 6.5 per cent.

In general there was very little difference in the thickness of the shell obtained from either type of sand. In some cases a slightly thicker shell was recorded at the mould face made in the black sand. A few experiments were included in this series in which the rate of solidification from the mould face in "green," black sand was compared with a mould face in the same sand dried for one hour at 200 deg. C., the result being that no difference in shell thickness was apparent.

Similar experiments were carried out with a super-purity aluminium. In no case was there any tendency for the shell thickness to vary in moulds of black or red sand or of "green" and dry sand in the same mould.

FIG. 27.—*Component to replace core B in the slush-casting assembly so as to promote solidification from the mould wall.*



APPENDIX B

Data of Equipment and Material Used in these Experiments

(1) *Grading of sands used*

B.S. Sieve No.	Bromsgrove (washed)	Arnolds 26A fine sand	Arnolds 26A coarse sand
Plus 12	0	0	1
„ 18	0	0	3
„ 30	2	0	53
„ 46	6	1	40
„ 60	23	6	3
„ 100	42	53	0
„ 150	18	33	0
„ 200	6	5	0
„ 200	3	2	0

The Bromsgrove sand contained 11 per cent. clay, and 3½ per cent. bentonite was added to the synthetic sands. The black sand consisted of 8 per

FIG. 28.—*Results obtained for slush-casting iron in a cylindrical test mould of black sand containing 6½ per cent. moisture (a) for low-phosphorus and (b) high-phosphorus iron, both poured at* 1,250 *deg. C.*

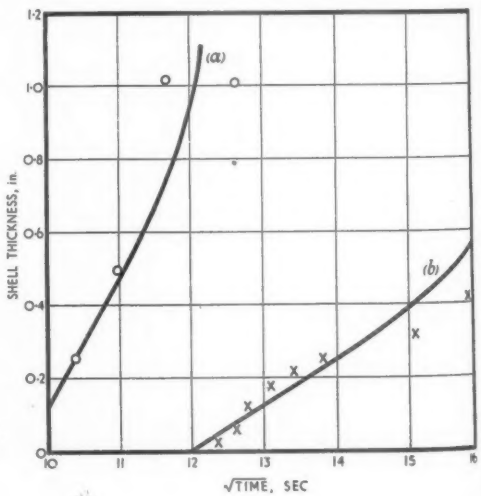


TABLE V.—*Relative Cooling Power of Naturally-bonded Sands.*

Sand.	Hensall. B.1.	Bromsgrove. B.2.		Bromsgrove plus Coal-dust B.2. B.		Mansfield. B.3		Erith. T.	
Grain-size	60/100	60/120				100/250		150/250	
	Dry.	Dry.	"Green."	Dry.	"Green."	Dry.	"Green."	Dry.	"Green."
Density:									
1.11–1.2	—	45		47		—		39.5	
1.21–1.3	—	—	51	—	54	—		—	44 (5) 46 (8½)
1.31–1.4	47	51 55 (*a*)		—		45		41	
1.41–1.5	49.5	46		49.5		—		46	
1.51–1.6	—	51	53.5	—	56	50		—	48 (5) 50 (8)
1.61–1.7	56	—	57		58	51		—	
1.71–1.8	—	—		—		—		—	

Note: (*a*) 8 per cent. coal-dust added.
For the green sands, the figures in parenthesis are percentage moisture.

cent. superfine coal-dust added to above sands as indicated in Table I.

(2) *Plate sizes, moulding box sizes and method of moulding:*

Plate	Moulding box	Method of moulding
6-by 6-by ¼-in.	10-by 10-by 3-in.	2-part mould; pattern in bottom part
6-by 6-by ½-in.	10-by 10-by 3 and ½-in.	3-part mould; pattern in ½-in. middle part
6-by 6-by 1-in.	10-by 10-by 3 and 1-in.	3-part mould; pattern in 1-in. middle part
6-by 6-by 1½-in.	10-by 10-by 3 and 1½-in.	3-part mould; pattern in 1½-in. middle part
6-by 6-by 3-in.	12-by 12-by 3½ and 3-in.	3-part mould; pattern in 3-in. middle part

(3) *Thermocouples and Recorders:*

(*a*) Noble-metal thermocouples were used for taking the pouring temperature of the metal; the e.m.f. was measured potentiometrically and the result expressed in temperature was accurate to plus or minus 5 deg. C.

(*b*) Thermocouples were only used in the moulding material on 3-in. thick plates, as thinner plates did not give solidification times sufficiently long for thermal analysis.

(*c*) Temperature measurement in casting and mould material was carried out with 28-gauge chromel/alumel thermocouple wire.

(*d*) Thermocouples in the mould cavity were protected with thin refractory sheathing, except the hot-junction end, which was lightly coated with a thin alumina wash over a length of ½ in.

(*e*) Thermocouples inserted in the mould material were protected either with a strong refractory or metallic sheathing (Pyrotenax) except for the last ½ in. which was left bare.

(*f*) *Recorders:*

For temperature changes in the casting, a Tinsley recorder was used. For those in the moulding material, a Speedomax high-speed recorder was used. The response of these recorders is of the order of ⅛ and 1 sec. respectively for the full scale of the temperature chart, which can be adjusted to correspond to full-scale deflection of 2 to 20 or 15, 30 and 45 m.v. respectively. In this way, different sensitivities of temperature recordings can be obtained and results are accurate to plus or minus 2 deg. C.

(4) *Metal:*

(*a*) Cast iron of composition 3.2 T.C.; 2.16 Si; 0.9 Mn; 0.12 P; and 0.9 per cent. S was used; half the furnace charge being of virgin ingot and half of remelted metal.

(*b*) The melting method for plates up to 1-in. thick was a high-frequency furnace and for those over 1-in. thick, a single-phase arc-furnace.

(*c*) The pouring temperature was 1,250 deg. C. unless otherwise stated.

(*d*) For the aluminium-bronze a eutectic containing 8 per cent. aluminium was melted in a gas-fired crucible furnace, no flux being added.

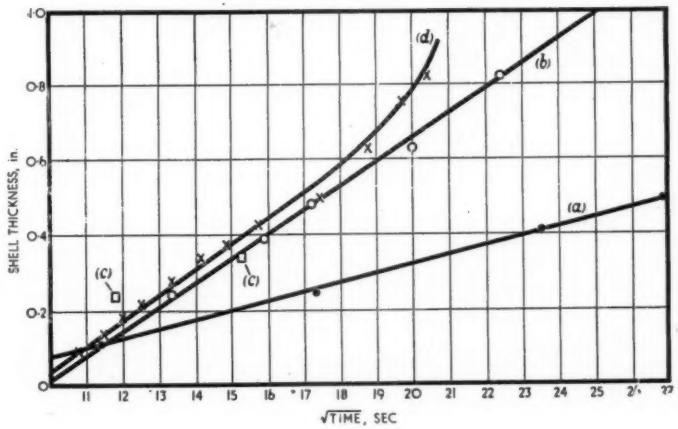


FIG. 29.—*Results obtained from slush-casting experiments with various metals in cylindrical and rectangular black-sand moulds having 6½ per cent. moisture.*

(*a*) Super-purity aluminium; (*b*) commercially-pure aluminium and (*c*) copper in a rectangular mould and (*d*) commercially-pure aluminium in a cylindrical mould. Pouring temperatures: Al. 750 deg. C.: Cu, 1,160 deg. C.

TABLE VI.—*Relative Cooling Power of Synthetically Bonded Sands*

Sand.	Redhill coarse.		Redhill medium.				Chelford medium to fine.		Arnolds.		Redhill fine.	
	14/28		F.		14/28 + F.		G.		26A.		H.	
Grain-size ..	30		60/100.		30/100		80/120.		80/140.		120/200.	
	Dry.	"Green."	Dry.	"Green."	Dry.	"Green."	Dry.	"Green."	Dry.	"Green."	Dry.	"Green."
Density:												
1.11–1.2 ..	—		—		—		—		48		—	
1.21–1.3 ..	—		—		—		—		—		41	
1.31–1.4 ..	52	57 (3)	47		—		44		51	56 (3)	—	
1.41–1.5 ..	54		—		53		—		55		42	
1.51–1.6 ..	—		51		53		45		58	60 (2.1)	—	
1.61–1.7 ..	—		—		54		46		—		47	
1.71–1.8 ..	53		52		54		—		—		—	
1.81–1.9 ..	61	62 (3)	—				—		—		—	

Note: For the "green" sands, the figures in parenthesis are percentage moisture.

(*e*) The pouring temperature of the aluminium bronze was 1,250 deg. C. but the metal was previously superheated to 1,350 deg. C.

APPENDIX C

Comparative Cooling Power of Sands

Tables V and VI provide some quantitative measure of the cooling powers of various commonly-used foundry sands under different conditions. The concept of cooling power used here is derived from the basic heat-flow equations as discussed in the Report, where the amount of heat abstracted from a casting is proportional to the interface temperature, a constant depending on the mould material and the square root of the time elapsed from commencement of pouring. Although this expression is correct for very large plates only, it may be used to compare cooling powers relatively, as long as similar casting shapes are considered. The figures given in the table are derived from the expression:—

$$\text{Cooling power} = \frac{\text{Casting thickness in inches} \times 1{,}000}{\sqrt{\text{Solidification time in seconds}}}$$

This expression can therefore be used to determine the solidification times of various castings of different section size, provided the solidification time of one is known; and also to compare solidification time of a casting made in various mould materials.

[The report was presented at the Congress by Mr. J. Hird, chairman of sub-committees TS. 33 and 46 (and a member of TS. 21) with Mr. J. Bell in the chair.]

DISCUSSION

MR. J. L. FRANCIS raised a point regarding the use of red sand, which had been mentioned as a very old practice. It was used, he believed, to overcome porosity in certain parts of castings, mainly in places where there was a hot spot or the sand mould "entered again" into the casting at what was called a re-entrant angle. The action there had been explained many years ago by Mr. Léonard, and was not so much a question of extra speed or rapidity of cooling caused by red sand. If one used raw red sand in place of ordinary "green" facing sand it meant there was an absence of coal-dust and organic material which was gas forming. From a portion of re-entrant sand, which possibly reached the temperature of the iron before the casting solidified, there was the formation of gas and this might penetrate the casting. Therefore, the effect was not purely a question of shrinkage but also a question of gas formation and entrapment in the casting. If one put red sand at that point then there was less gas evolved and a defect was probably eliminated.

MR. HIRD said there was very little which could in fact be said in reply to Mr. Francis and he appreciated his point of view, namely, that in some cases entrapped gases might be the cause of the defect which red sand was used to cure.

MR. E. LONGDEN said he had frequently voiced the opinion that re-entrant angles formed a hot spot and were under high gas pressure, but more had been learned in recent years about the effect of atmospheric pressure. It was his belief that porosity at hot spots was a combination of mould and atmospheric gas-pressures.

MR. HIRD replied that it was rather interesting to have two explanations; he agreed both of them were possible. Previously no one seemed able to say why they worked and it had only been agreed that they did: now two explanations had been put forward, as well as the sub-committee's findings that red sand could act as a mild chill.

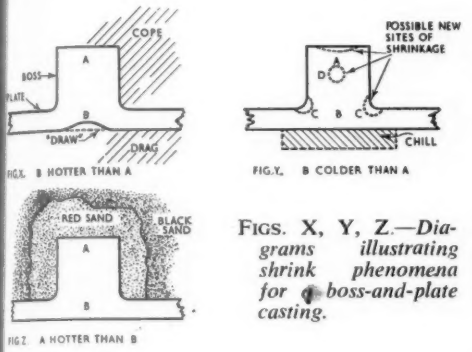
Sinking at Bosses

MR. J. H. GITTUS said that he wished to discuss the reasons for the apparent effectiveness of the practice of using raw red sand to alleviate the sinking associated with bosses in light castings. It was commonly believed that this practice was successful because the red sand acted as a mild chill. However, the results reported in the present report indicated that, in fact, the red sand should be a better insulator than the rest of the mould, a finding which was confirmed by the work of Dunphy and Pellini.*

It therefore became desirable to re-examine the mechanism of sinking under bosses. In this connection, he knew of at least one application in which red sand was employed to prevent "drawing" under bosses, and where one would not expect it to act as a chill but rather as an insulator. He was thinking of the case where one had a horizontally-moulded

* Dunphy (R. P.) and Pellini (W. S.). Trans. A.F.S., 1951, v. 59, p. 425.

light casting, on the top of which there was a series of bosses. The shrinkage defects associated with the bosses, which particularly troubled foundrymen, were those which occurred on the bottom surface of the casting, namely, on the surface which the customer could see (Fig. X). Shrinkage defects in the bosses themselves were not so objectionable unless they were so severe as to constitute a real mechanical weakness, because the bosses were not usually visible on the article for which the casting was intended. A " draw " was actually caused by deformation of the casting skin, by atmospheric



FIGS. X, Y, Z.—*Diagrams illustrating shrink phenomena for boss-and-plate casting.*

pressure, during solidification. It occurred at the point where the resistance offered by metal pressure, and by the rigidity of the casting skin, to atmospheric deformation of the latter was least. In the case cited in Fig. X, the draw had occurred where metal pressure was *greatest* (*i.e.*, on the drag surface of the casting). Hence the skin in this region must have been very much weaker than in any other part of the casting, at the time when drawing occurred. This meant that solidification was least advanced at the point where drawing occurred (B *hotter* than A, in Fig. X).

One way of preventing drawing would therefore be, to apply a chill to the surface at which it occurred (Fig. Y) thereby accelerating the rate of skin solidification in region B (Fig. Y). The draw would then occur in some other part of the casting and the most likely sites were A (where the metal pressure was least), C (at a re-entrant angle) or D (heat centre). Pursuing this argument, the use of red sand round the boss, for the same purpose, appeared quite logical (Fig. Z). Since the red sand had a *lower* chilling power than the rest of the mould, it would *retard* skin solidification in the boss, which would therefore draw in one of the positions indicated in Fig. Y, the drag surface remaining sound.

MR. HIRD said he was afraid he could not agree; the sub-committees reported that the indications were that the red sand acted as a mild chill, whereas Mr. Gittus said that the blemish was on the bottom face behind the boss, but surely it could not be a " sink " if metal was moving uphill.

Defective Formation

MR. J. H. GITTUS explained that the subject of sinking and drawing under bosses on light castings had been studied at the British Cast Iron Research Association, and a paper published on the subject.* One of the findings of this work was that shrinkage defects could, and did, occur on the under surface of castings, despite static metal-pressure.

MR. HIRD said he was not denying that there must be a fault there, but it surely could not be a sink if it went uphill—there must be something else causing it.

MR. GITTUS pointed out that shrinkage defects were actually due to deformation of the semi-solid casting-skin by atmospheric pressure. They occurred at points on the surface of the casting where the resistance to such deformation was least. The resistance to deformation was actually due to the combined effects of the rigidity of the solidified layer, and to the local static metal-pressure. When a " sink " occurred in a part of the casting at which the static metal-pressure was high, one should infer that this was a region in which rigidity of the solid casting-skin was relatively low.

MR. HIRD replied that that was possible but the defect was certainly not caused by the actual junction of the heavy section and the thin section at the top.

MR. GITTUS said that in the particular case under discussion, the thin section was not at the top, it was at the bottom. The casting exhibited defects on its under surface, which were undisputably due to atmospheric-deformation at the weakest part of the casting skin during solidification. This deformation compensated the differential expansion of the casting-skin and its semi-liquid contents. It was, in fact, a shrinkage defect.

MR. HIRD said that was another thing entirely from the sinking which one associated with the junction of a heavy and a thin section, and was caused by insufficient feed metal for the heavy section. The type of defect Mr. Gittus described would only occur in thin castings. There would seem to be a case for a term to describe this type of cavity, when it is caused by atmospheric pressure and not gravity.

MR. E. LONGDEN said many foundrymen had experienced similar defects, namely a hollow formed on the underside of a boss in what was otherwise a light casting comprised of comparatively thin plates of $\frac{1}{8}$-in. to $\frac{1}{4}$-in. section and with a boss, say, $\frac{1}{2}$-in. in depth. It had been his opinion that due to the relative rates of cooling, there was a comparatively heavy mass of metal in the boss and that it was not a true metal " shrink " because the gases formed in the boss part of the mould occupied some of the space for a time and did not allow the metal to fall and sink to the face of the mould. Experiments should somehow be made to try to conduct gas away from the underside of the mould forming the boss and see what happened. A pencil riser could usefully

* Hughes (I. C. H.). BCIRA, *J. of Res. and Dev.*, 5 No. 11, April, 1955.

be located on the side of the upper face of such bosses or facings.

MR. J. HIRD, in reply, thanked Mr. Longden for his remarks because that was exactly what he had been trying to say.

A Further Explanation

MR. I. C. H. HUGHES said he had been working at the BCIRA in collaboration with Mr. Gittus, and he had spent some time in studying the defects which were now under discussion. He would like to make it clear that his studies of bosses on thin plates of that type had indicated that the sinking defect which was being discussed could take place on the face of the plate opposite the boss. That occurred regardless of whether the boss was cast uppermost or downmost. If the boss was cast underneath the plate, the sinking would be greater; *i.e.*, if the sinking occurred in the top surface—if the boss were cast on top of the plate, as was common practice in the light casting industry—there would still be sinking underneath the boss. He had yet to see a light-section casting in which he was quite sure there was no change in contour opposite the boss; even though the change might be extremely slight there was usually a very slight depression which could be measured with a suitable instrument.

Studies of the microstructures of bosses cast on such thin plates had indicated that there was strong columnar crystallization occurring inwards from the edges of the top of the boss, suggesting that the top corners of the boss in fact were acting as a mild chill. In the boss one had a comparatively large mass of metal which solidified slightly later than the plate, that shrinkage could not be accommodated by shrinkage of the top of the boss because that part of the boss, relatively speaking, was chilled. The shrinkage could only be taken up by a caving-in of the surface of the casting, either on the surface of the plate or in the angle between the boss and the plate, and in actual fact it would usually be found that when severe sinking occurred in the plate that sinking or drawing also occurred in the angle between the plate and the boss. The explanation put forward by Mr. Gittus with regard to the effect of red sand in the light of those observations seemed to be a reasonable one, and he supported that view.

MR. LONGDEN said he would contest that theory, and a simple empirical test could prove his new version. If a densener were placed on the top and bottom faces of the boss it would eliminate gas pressure. The conductivity of the densener and the quality of the iron must be such as would allow the metal to solidify with a grey fracture. It would be found that there would be no sinking of the boss, either of top or bottom faces, if care were exercised to protect the faces of the clean densener from moisture, and a pencil riser was located on one side of the upper face of the boss. The densener should not cover more than 75 per cent. of the central area of the boss.

MR. A. DUNLOP, quoting the title of the report, said it ought to be easy to determine the effect of normal moulding sand—not red sand—to see what effect that had on solidification rate. Surely if the material contained coal-dust then that had a higher rate of heat extraction from the metal than red sand. It seemed on the question of using it on a boss, one person said it acted as a chill and another that it was an insulator.

DR. V. KONDIC, in reply, said he was rather sorry that the discussion had gone away from the main subject of the report. The sub-committee had been hoping that the work described would throw some light on the problem of "sinks" at the re-entrant corners, but the terms of reference did not ask them to deal with the specific question of surface defects.

MR. N. E. TIDSWELL said he agreed absolutely with the observations put forward by Mr. Hughes. When he had experienced that defect his one ambition had been to get rid of it; red sand, chills, and everything else had been tried, and it made no difference, so eventually the phosphorus content of the cast iron had been reduced to 0.25 per cent. and there had been no more trouble.

MR. HIRD said the mention of red sand in the report was purely incidental, and he thought the subject should be dropped. Those who wished to pursue the matter further might consider there was ample scope for a paper on little bosses on flat plates!

Function of Coal-dust

DR. D. V. ATTERTON said that he was most impressed with the very good correlation which had been obtained in various sections of the report and felt that the sub-committee had not emphasized this sufficiently. The report seemed to be one of those rare pieces of work where there was good agreement between theory and practice. For example, considering the figures in Table I, the solidification times did show an extremely good correlation with the known values of diffusivity of the moulding materials and he wondered why the sub-committee had been reticent on this and similar points.

At the bottom of page 15 of the preprint he queried the reasons put forward for the effect of coal-dust on apparently increasing the chilling power of moulding sands. It was suggested that the coal-dust would be deposited on the sand grains and would increase their emissivity and hence the proportion of heat transferred by radiation rather than by true conduction. There were very few published values for the emissivity of silica but it was generally accepted that this was of the order of 0.95 or more. Consequently, it would appear that the greater chilling power of coal-dust-containing sands is due to some other reason to the one proposed in the report.

Referring to Fig. 24, Dr. Atterton said that he had been misquoted slightly as to the influence of fines on decreasing the thermal conductivity of sands. He was inclined to doubt the diagrams shown under (*c*) and (*d*) where it was suggested that the fine sand grains had forced the coarser ones apart and wondered whether any experiments had been carried

out to support or alternatively disprove this suggestion. For example, were any permeability values recorded for the sands? The impression given by the diagrams was that there would be an increase in permeability, whereas he felt fairly certain that a decrease would have occurred.

DR. KONDIC, in reply, said with regard to theorizing on the report, quite frankly that had been left for some subsequent papers due to be published later. It had been demonstrated at one of the discussions of the Congress what happened when one tried to bring mathematics to explain some of the casting problems, and the sub-committee had decided, in anticipation of that sort of thing, to explain their points in a simplified manner. On the question of the effect of coal-dust on emissivity, and also on the question of fine sand additions to any other sand, and the relative inter-effects of permeability, and emissivity as described in the latter part of the report, the sub-committee had assumed a modicum of freedom in interpreting the results. These effects could, of course, be measured more accurately and if one tried to explain such results theoretically, no doubt that could be done. Much more experimental work was, however, required for a fuller theoretical treatment of the problem of heat flow in sand moulds.

MR. G. R. SHOTTON said, as a member of the sub-committee over the whole period, that he had not agreed that red sand showed any pronounced chilling effects when the committee work commenced and he still disagreed. He felt very sorry that the discussion had followed that theme because it really was a minor part of the work.

He wanted to draw attention to the fact that the influence of mould materials had been studied at considerable length, and he thought it should be emphasized that the influence of ramming density appeared to transcend all other individual influences. Most of the sub-committee members had been well aware that in practice one rammed a mould soft if there was difficulty in running the casting but he thought without exception the whole of the members were astonished at the results obtained. He thought solidification time could be actually decreased by as much as 25 per cent. by the effect of mould density alone. He wished thus to emphasize something which the discussion so far had ignored, namely that the mould density had a very pronounced effect, as had several other variables which were tested by the sub-committee.

Effect on Structure

MR. J. B. MCINTYRE said that in the National Foundry College some work had been carried out not only on cast iron but also on five non-ferrous alloys, and it had been found that the difference in microstructure, in soundness and in general hardness as measured by the Vickers machine was not significant between castings made by identical methods in green-sand and in dry sand. In no case was there any significant difference in the structure, but in the cooling rate as measured by thermocouples it had been found that there was an appreciable difference. This was a strange thing since the weight of the castings concerned was less than 2 lb. each. One casting was actually less than $\frac{1}{2}$ lb., and though it might be assumed that such small volumes of metal would be easily influenced by cooling-rate variations that had not been found to be the case.

He appreciated that the sub-committee had been dealing with simple shapes, but it would be interesting to know how soon they could pass to the study of cored shapes, though not necessarily much more involved than those which had already been discussed. It should always be borne in mind that the majority of commercial castings were of the cored variety.

Place of Mathematics

DR. KONDIC said if he had to answer the question, as to whether there was any worthwhile result from the work reported, he would say that the main practical value at the moment was in applying the results to the problem of risering of castings. After all, risers were in most cases simple shapes and the work described in the report did give some idea how to predict the solidification time of a simple riser. He hoped that in this connection, at least, some members would derive value from the publication.

With regard to the more complex sand-cast shapes, the problem of heat flow in such cases was a formidable mathematical obstacle, so he would say that the main line of attack in such cases was likely to be empirical. He could not see any likelihood of trying to solve the problem of solidification time of shapes such as were met with in the foundry industry, along purely mathematical lines, but some of the results available could be made use of to obtain very useful empirical relations, which were made even more valuable by a skilful use of mathematics.

Casting of Test-pieces

MR. ROGERS said the title of the report was implicitly one of chilling, or a modified form of chilling but, as a practical foundryman, many years ago he had used pieces of old crucible as a conductor of heat against bosses, or, better still, silicon carbide and also the bedding-in of iron rods close to the surface to help conduct heat away, all leading to the same point. Now, however, there was a material which did that job, namely, a zircon compound, and he wondered if the sub-committee had experimented with that at all as it had not been mentioned in the Report. He personally had conducted many experiments with this material and thought the most striking example of how it conducted heat away—causing progressive solidification which gave one a sound casting—was in the fact that if one rammed up the necked portion of the standard non-ferrous test-bar in this proprietary refractory and left the two ends of the bar and the runner and the riser in ordinary sand, one would be impressed by a wonderful improvement in test results. Non-ferrous founders could try it themselves; he knew it was perhaps unorthodox, but it seemed from experience gained over the years, that to be regarded as a good foundryman one had to develop the science of making good test-bars! If one properly melted virgin materials, such as for gunmetal—

although members had been talking about cast iron, virgin material for non-ferrous work gave one no chance of difficulties with the makers' different compositions—and one properly controlled the moulding, it was possible to get 23 and 24 tons tensile with 88/10/2 gunmetal test-bars. Anyone who wished could see such results reported in the FOUNDRY TRADE JOURNAL of May 19, 1955. It was not just a chance result but a result which could be repeated, and had been repeated, and in every case one could get test-bars giving that type of result. The experiment showed the advantage derived by selective chilling and getting progressive solidification, and also the fact that when the tensile increased the elongation decreased a little, which indicated the trend of chilling.

Much had been said about the difficulty of plates with bosses on, for which his cure was simply to place a sprig in the boss to stimulate freezing because it usually had to be drilled eventually. His present submission was that the sub-committee should investigate the use of zircon materials.

THE CHAIRMAN reminded the meeting that members were not discussing what the sub-committee should do but what it had done.

MR. H. HAYNES, referring to page 6, column 2, item three of the preprint which read " Gating and Pouring must be Standardized," said the word " must " was a very important word to use as regards the pouring of castings and he would like to know why it had been put in that way.

MR. HIRD said it was only used in referring to the making of the test-pieces because if one did not standardize the method of running for all the tests then the effect of altering the running between one test and the other could upset the results. There was no suggestion that the runners should be standardized in individual foundries.

DR. J. T. BERRY, referring to the remarks made by Mr. Rogers, said he would like to point out that figures for thermal diffusivity or mould constant were already available for silicon carbide, magnesite and certain other refractories, through the work of Mr. Ruddle.* These values were for the bronze and aluminium range of castings. As regards zircon sand, speaking as a person who had done perhaps more than a little of the moulding for the sub-committee, he had carried out some tests with zircon sand, but as Mr. Hird was probably going to point out, the committee had confined themselves mainly to silica and natural sands since there are so many variables. However, it was hoped to publish in the future some of the results that had been obtained for other materials.

MR. R. W. RUDDLE said that within the last year or so the Americans had published some results of work on the chilling power of zirconia, steel shot, and various other possible materials for use in local chilling.

MR. H. G. HALL said Dr. Kondic had intimated that after seven years of very hard work he felt the results could perhaps be applied to runners, risers and so forth, as they were simple shapes. He himself was a member of a committee which dealt with the yield of castings and in which, therefore, runners and risers were of some importance and he would like to ask Dr. Kondic if he would help in that work by indicating in what way the sub-committee's work would be of assistance to his own committee.

Latent Advantages

Similarly, he just did not believe that after such a quantity of excellent work the results were as insignificant as had been suggested and he was going to prove that, he hoped, by asking Mr. Hird to think back over the seven years and to say what he had done in his own foundry as a result of that work. There must be some improvement which he had made as a direct result.

DR. KONDIC, in reply, said that the first comprehensive work of this kind was initiated by Chvorinov many years ago, who claimed that the solidification of sand castings in any complex shape could be related to such simple relation as volume/surface-area ratio. American workers had taken up the problem of heat transfer in sand moulds more recently and had shown that there were certain restrictions to the Chvorinov's rule and strange as it might seem they had missed an important variable in their work. Much of their work published during the last few years did not pay sufficient attention to the variable of sand condition in the mould which the British sub-committee had studied. Thus, one of the valuable conclusions which had been reached by the sub-committee was to stress the importance of moulding variables in studying in general the problem of rates of cooling of shaped castings.

With regard to the question as to what was the correct way to apply the data reported to the problem of risering, he would say that in addition to the factors which had been described, and to some other well-known relations, there were ways of applying Chvorinov's rule to predict times of solidification and getting fairly accurate estimates. One of the most important considerations was that of not ignoring the end effects. But there was a number of other restrictions in applying Chvorinov's rule, which must be taken into account in solving the problem of cooling times in sand moulds.

MR. HIRD, extending the reply, said that in the early days when the sub-committee had been unable to get results that were reproducible, it had been found that if there was a tiny flash on a casting the effect on the cooling rate was really very marked, and he found that if there was a casting which he wanted to cool rather quickly in one part and he purposely put a flash on it the casting would be cooled more rapidly at that point and segregation prevented there. That was the only practical application to which he had put any information which had come to light during the investigation but he believed that by having the report, practical foundrymen would know the effect on the cooling rate of a casting which was caused by ramming a mould hard or by changing the type of sand. Also investigators would have useful information on the conductivity of sands in various conditions.

* R. Ruddle and A. Mincher, *J. Institute of Metals*, 76, 43.

MR. J. O. EDWARDS (Canada) said that apart from the theoretical interest of the report, some doubts had been raised as to its usefulness to the practical foundryman. It would seem to him, however, that the report gave the foundryman a very useful tool for checking variations between different batches of castings in that it gave definite information as to where to look for variables in moulding technique.

Mould Dimensional Variations

MR. HALL said the ramming density appeared to have a profound effect on the solidification rate and he would like to ask whether the sub-committee as a whole could agree with Mr. Gittus on that point. Mr. Gittus had done a quantity of work which had suggested that in a green-sand mould the mould-surface expanded and there was a greater volume, therefore, as opposed to a dry mould. Knowing Mr. Gittus, he would not mind asserting that he had attempted to correlate that fact in some way with the difference in density between the various sands and the solidification rate.

MR. GITTUS said that he had made many attempts to predict the variation in mould/cavity dimensions during solidification, from the basic properties of various sands. Experiments had indicated clearly that these variations had an important bearing on the magnitude of the shrinkage defects observed in iron castings. In particular,, an explanation of the difference between the degree of shrinkage in castings from green- and dry-sand moulds had been obtained.* It was found that, during solidification of the primary phase, the cavity in a dry-sand mould diminished in volume, compensating the solidification-contraction of the casting. In a green-sand mould, the reverse occurred and the size of shrinkage defect was augmented by an increase in the volume of the mould cavity, which occurred whilst the casting was still in its plastic condition. He had tried to predict the magnitude of these changes in mould-cavity dimensions for various sands, from their thermal properties. Where these properties were not ascertainable from the literature, he had calculated them from the density of the mould and the grain-size distribution of the sand.† Unfortunately, the remainder of the calculation hinged round the temperature of the mould/metal interface. Experiments had failed to provide satisfactory measurements of this factor, since the introduction of a temperature-measuring element, such as a thermocouple, upset the temperature conditions.

MR. HALL said according to the combination of the theories of Mr. Gittus and the work of the sub-committee the harder one rammed a mould, the less gap there was at a certain stage in heat distribution between the solidified metal surface and the sand itself; in other words it could be put forward that with a soft-rammed mould there was an air-gap which might affect the conductivity of heat away from the mould.

Practical Example

MR. A. TIPPER said he could quote a practical example which had recently reached him and which confirmed, he believed, what Mr. Gittus had said. He had been advised by a friend who had previously made valve castings in green-sand moulds and was now making them in a special hardened mould that he did definitely get a sounder casting from that strong mould. His friend's explanation was perhaps rather crude but it suggested that when one had a rigid mould as against a mould which could readily deform, then the rigidity and strength of the mould, or its ability to retain its shape when heated, did affect dimensions and the structure of the casting, to its advantage.

DR. D. V. ATTERTON said that work carried out in the laboratories of his firm might be of interest to the sub-committee; it was on the chilling power and thermal conductivity of CO_2-bonded sands and he did know this agreed rather well with some of the work Mr. Gittus of the BCIRA had been doing. It appeared that sands bonded with CO_2 Process binders had initially a thermal conductivity about 4 to 5 times as great as the same sand bonded with conventional binders; this higher thermal conductivity disappeared as the sand was heated and approached similar values to those of conventionally-bonded sands after being heated to above about 100 deg. C.

Metal/Mould Interface

Mr. Gittus had also mentioned the question of interface temperature measurement and had stated that no satisfactory determinations had been made. In conjunction with Dr. D. H. Houseman, the speaker had developed a technique which had given reasonable and consistent results on steel castings.‡ The technique consisted essentially of pushing two thermocouple wires through the mould/metal interface and relying upon the molten metal of the casting to act as an intermediate metal and form a hot junction. This technique had the following important advantages: (1) It minimized thermal lag; (2) it ensured accurate location of the hot-junction at the metal/mould interface, since the hot junction was formed at the points where the molten metal came into contact with the thermocouple wires, and (3) it eliminated errors due to temperature gradients such as occurred when using protective sheaths over thermocouples. This method had given reliable results on a steel casting of about 280-lb. cast weight and showed that the metal initially solidified at the interface, and then re-melted at the liquidus temperature of 1,513 deg. C. and then remained molten for approximately 50 sec. at the interface, reaching a maximum temperature of about 1,525 deg. C. during this period.

MR. GITTUS said he had been aware of Dr. Atterton's technique and had attempted to employ it but had never been successful in the case of iron castings.

MR. RUDDLE said the method described by Dr. Atterton measured the temperature of the metal side of the interface. It might be argued that, as the

* Gittus (J. H.). *Iron and Steel*, July, 1955.

† Gittus (J. H.). BCIRA, *J. Res. and Dev.*, 6, 318.

‡ D. V. Atterton and D. H. Houseman. *Nature*, 171, 980 (May 30, 1953).

result of air-gap formation or otherwise, there was a temperature discontinuity at the interface and that the sand adjacent to the metal was at a considerably lower temperature. However, he did not in fact believe that this was likely in sand moulds, except under very exceptional circumstances. He thought the gap to be so small that radiation across that gap would result in the temperature of the sand face approaching very closely that of the metal face.

With regard to the chilling power of the carbon-dioxide-hardened mould, he had been very interested to hear Dr. Atterton's remarks on that point. Dr. Atterton had said that the chilling power of that material was about six times as great as that of normal sand but that it fell rapidly on heating: could he say how rapidly it fell and on heating to what temperature? Was it Dr. Atterton's opinion that such an effect would appreciably affect the temperature of a casting?

DR. ATTERTON said that there would certainly be a faster rate of heat abstraction with CO_2-set bonded sands, but the effect would probably be negligible, except for thin-section castings. He did know that one or two people were utilizing this chilling power to advantage by producing their test-bar moulds in such sands.

MR. RUDDLE said that might not be so, because the high chilling power of the part of the mould below 150 deg. C. might well steepen the temperature gradients present in the hotter part to an appreciable degree.

Useful Pointers

MR. HIRD, making a general reply, said it might appear that the sub-committee had spent some of the seven years during which the work had been going on wondering where they were going, but they had in fact achieved some very definite and surprising results as to the effect of coal-dust, mould-density and sand grain-size and what they had found out would be equally applicable if tests of other materials were visualized in future. It had taken a number of years to develop a method which gave reproducibility of results and the sub-committee were not giving their report as a *fait accompli* but as a jumping-off point for further investigations which might be deemed helpful in any direction. He, personally, hoped that from the discussion which had taken place suggestions and ideas could be obtained as to the direction which any future work for which there was a demand might take.

DR. KONDIC said for the better part of the afternoon members had been discussing how to make castings with good surfaces: the sub-committee's work did help a little towards answering the question as to how to make castings sound inside as well!

MR. RUDDLE, referring to the question of the use of work of the kind carried out by the sub-committee, said first of all, in his view, there were certain immediate uses. He believed, for example, the work would be of help to Mr. Hall's committee in calculating such matters as the correct size of feeders, and so on. However, the main application of data of the kind collected would come in the future. Work on heat flow in moulds was of a very long-term, fundamental nature, and although one might not see any very exciting applications in the foundry in the next five years he hoped that within the next 25 years information of this kind would enable foundrymen accurately to predict the progress of freezing in their castings and thus to determine the correct way of running, feeding and chilling them.

THE CHAIRMAN (Mr. J. Bell) said the sub-committees had been concerned with research into some very important matters dealing with the routine work of making castings. With the many different types of castings to be made, it was difficult to reach conclusions that would be uniformly applicable among so many variables. The sub-committee had not been afraid of the problems they had to face and had done a very good work indeed. All its members deserved the warmest thanks for what they had done and for the interesting and informative manner in which it had been presented.

A hearty vote of thanks was accorded to Mr. Hird for presenting the report, and the session then terminated.

Stanton Coke Plant Extended

An extension to the existing coke-oven plant of the Stanton Ironworks Company, Limited, at Hallam Fields, Ilkeston, was officially opened last week by Mr. Geoffrey Lloyd, M.P., Minister of Fuel and Power. A luncheon, which followed, at which some 300 guests were present, was presided over by Mr. A. G. Stewart, chairman of the firm.

The original coking installation at Hallam Fields, built in 1939, consisted of a battery of 41 Woodall Duckham Becker combination regenerative ovens designed to carbonize 860 tons of coal per day, and the ovens and coal-handling, blending and crushing plant were designed to produce a satisfactory blast-furnace coke when using a blend containing the maximum amount of low-grade coking coals from the Nottinghamshire coalfield.

In 1947, further technical developments were introduced, the chief of which was the oiling of the coal. These resulted in the through-put being increased to 960 tons of coal per day. In addition, gas purifiers, producers for dilution gas, gas-drying plant and boosters were installed to handle 6,500,000 cub. ft. per day of gas sold to local gas undertakings.

In 1951, it was decided to carry out extensions and, at the same time, to incorporate blast-furnace gas-cleaning units at the company's two blast-furnace plants. As a result of the latter, clean blast-furnace-gas became available for underfiring the original ovens. The substitution of this for the coke-oven gas used hitherto took place in September, 1954, increasing the sales to the Gas Board to 12-million cub. ft. per day. In addition to the new battery of ovens, new gas-purification, drying and boosting plants were installed in place of the original plants in order to deal with the extra coke-oven-gas generated. It was also possible to use clean blast-furnace-gas for the dilution to the specified calorific value (485 B.Th.U. per cub. ft.) of the coke-oven gas instead of the producer-gas previously used. At the same time the coal-blending plant was improved by the installation of constant-weight feeders, so that a proportion of the rich coking coals could be re-placed by coals of poor coking qualities available locally. The new battery came into operation in April, 1955.

Hot-dip Aluminium Coating for Cast Iron*

By Shigetomo Ueda

[SLIGHTLY ABRIDGED]

There are several methods of coating iron and steel with aluminium. Amongst these, the hot-dipping method is believed to be that which not only enables the aluminium-rich layer to be comparatively thick but is simple and inexpensive in operation[1]. An increase of carbon content in iron or steel makes aluminium coating difficult to carry out in the case of cast iron[2].

In researches conducted by Prof. Dr. M. Shiozawa and Mr. H. Nakai on "Sulphurization Resistance", it was observed that cast iron to which aluminium had been added was excellent in sulphurization resistance. This fact suggested that cast iron, when coated with aluminium, would improve in sulphurization resistance. The Author conducted laboratory tests in order to clarify the sulphurization property of cast iron coated with aluminium

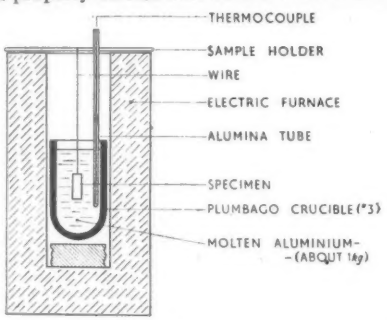


FIG. 1.—*Apparatus for experimental dipping of iron specimens in molten aluminium.*

and, at the same time, at several plants of industrial firms made experiments on the retorts used for manufacturing carbon-disulphide for the purpose of practical verification.

Dipping Experiments

The equipment for the experiments is shown in Fig. 1. The specimen, with a tiny hole at one end, was hung by a piece of Nichrome wire in the molten aluminium. Specimens which were too hard to be drilled were grooved by grinding, bound with Nichrome wire, and then suspended. The purity of the aluminium was 99.8 per cent.

The materials chosen for these experiments included six types of ordinary cast iron, varying in chemical composition, Swedish charcoal pig-iron, chromium cast iron (Cr 2.5 per cent.), aluminium cast iron (Al 4 per cent.), mild steel and high carbon steel—a total of 11 types of materials. Of these, 77 specimens, each of which weighed between 15 to 20 gm, were arranged. The specimens were mostly of rectangular shape. However, in order to find how the shape affected coating results, cylinder discs and semi-circular shapes were utilized. The experiments were conducted by varying the following conditions, which are the major factors in the hot-dipping method:

(*a*) Preliminary treatment (pickling, degreasing, rinsing in cold or hot water, etc.).

(*b*) Fluxing (variation of major component, *e.g.* $ZnCl_2$, dipping temperature and time).

(*c*) Molten aluminium bath (varying from 700 to 900 deg. C).

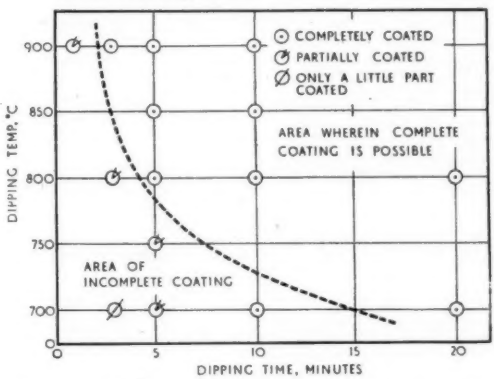


FIG. 2.—*Effect of time and temperature on the efficiency of coating.*

(*d*) Time for dipping in the molten aluminium (varying from one to 20 min.).

However, several specimens were dipped for from 30 to 60 min. to observe the effects of prolonged dipping.

The following were deduced from the appearances of specimens treated:

(1) The coating of cast iron is harder than that of steel. Difference of carbon content in steel may almost be disregarded—in contrast to cast iron.

(2) In the case of cast iron, when the preliminary treatment and the drying have been adequate, fluxing is not so necessary. Fluxing contaminates the molten aluminium bath.

* Report from the Castings Research Laboratory, Waseda University, Japan.

Hot-dip Aluminium Coating for Cast Iron

(3) If the temperature of the molten aluminium bath is high, the dipping requires only a short time. Contrariwise, at low temperature, the dipping requires much longer time.

(4) In these experiments, no differences were noted when various shapes of specimens were used.

Characteristics

Based on the results of preliminary experiments, the Author used the materials as set out in Table I in an effort to obtain the characteristics of the hot-dipping method, with the following results.

TABLE I.—*Chemical Composition (per cent.)*

Mat. No.	C	Si	Mn
2	3.68	1.60	0.43
3	3.81	2.10	0.43

(*1*) *Range of Aluminium Coating.*

An experiment was conducted in order to obtain the units within which the aluminium coating is complete; the results are shown in Fig. 2. Thus, in order to coat ordinary cast iron with aluminium, only a short time is required with a high bath-temperature.

(*2*) *Effect of Specimen Size.*

It was felt that the relationship between the quantity of the aluminium bath and the size of specimen for the dipping would affect the result of coating, especially the thickness of the coating layer. An experiment was made, accordingly, with the fixed quantity of aluminium bath and with the shape of specimen varied, the result being shown in Table II. As far as the current experiment is concerned —or within such an extent of heat-capacity proportion as from 1 : 90 to 1 : 15—the ratio has almost no bearing on coating thickness. (The thickness of coating layer is given as the total of the inter-facial alloy layer and the aluminium-rich outer layer, the measurement being made by use of a micrometer attached to the microscope).

(*3*) *Thickness of Coating Layer.*

The results of experiments conducted by varying dipping conditions in an effort to obtain the effect on the thickness of coating layer is shown in Fig. 3. The thickness increases directly as the bath temperature rises and the dipping time is prolonged, but on the other hand, the interfacial-alloy layer, although it grows thicker at high temperature, never does so at low temperature even if dipped for a long time.

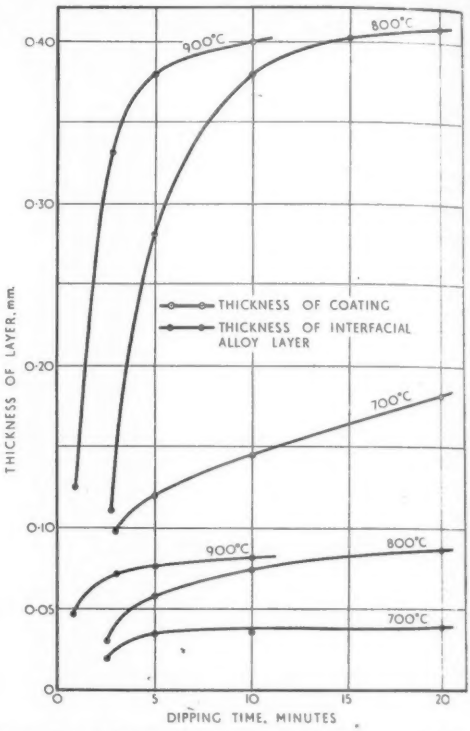


FIG. 3.—*Relationship between thickness of layer and dipping time at various temperatures.*

Sulphurization-resistance Property

The sulphurization tests conducted by the Author include both laboratory and semi-industrial tests. The shape of specimens for laboratory tests was

TABLE II.—*Effect of Specimen Size (with Fixed Quantity of Molten Aluminium.‡)*

Material No.	Size of specimen, mm.	Proportion of specimen size.	Dipping. Temp. deg. C.	Dipping. Time min.	Appearance of treated specimen.	Thickness of coating layer mm.
	30 dia. × 7 × ½*	—	900	10		—
	30 dia. × 10	—	900	5	Completely coated	—
	30 dia. × 10	—	900	10		—
4†	30 dia. × 5	1	900	10		0.46
	30 dia. × 10	2	900	10		0.45
	30 dia. × 15	3	900	10	Completely coated	0.46
	30 dia. × 20	4	900	10		0.45
	30 dia. × 30	6	900	10		0.45

* Semi-circular shape, all other specimens cylindrical. † C. 3.82 per cent., Si 1·67 per cent., Mn 0.28 per cent. ‡ Molten aluminium 1 kg.

11 by 11 by 18 mm. and the specimens were dipped in an aluminium bath at 900 deg. C. for 3, 5 or 10 min. The specimens were kept in a H_2S gas flow of about 5 litres per hr. velocity at the fixed temperatures of 900 deg. C. and 500 deg. C, in order to obtain the increase in weight. The result of this test is shown in Fig. 4. In the 900 deg. C sulphurization test, the specimen dipped for 10 min. at 900 deg. C showed sulphurization of about one per cent of that of untreated specimens, proving its sulphurization-resistance property. The relationships between the thickness of layer and the sulphurizing quantity are shown in Fig. 5. The sulphurization-resistance property of aluminized cast iron increases in proportion to the thickness of aluminium coating layer.

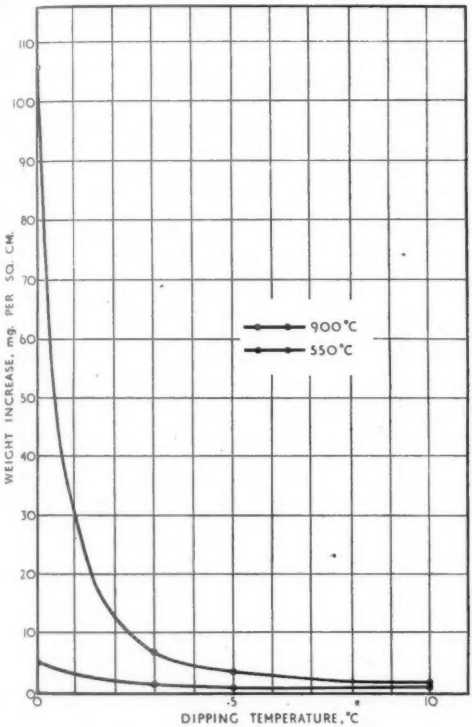


FIG. 4.—*Sulphurization-resistance property in hydrogen-sulphide.*

In addition to above laboratory tests, the Author, after dipping cylindrical specimens of such size as 30 by 30 dia. mm. at 900 deg. C and giving them aluminium coatings, sent these specimens to nine carbon-disulphide plants and conducted 30-day shop tests using their retorts. The conditions for the tests varied with the plant, but the temperatures in retorts were around 900 deg. C. The sulphurization property of these specimens was, generally, consistent with that which had been surmised by the Author based on the results of laboratory tests, quite satisfactory.

Conclusion

The coating of cast iron with aluminium is more difficult than with steel. However, if the preliminary treatment is properly carried out, the coating can be made completely without the use of flux. In this case, when the aluminium-bath temperature is high, only a short time is required for the dipping, and when it is low a much longer time is required. When dipping at high temperature for a long time, a thick coating layer can be obtained. The interfacial-alloy layer is never thick even when dipping at low temperature for a long time.

The sulphurization tests showed that aluminium-coated cast iron was excellent in sulphurization-resistance property, and the semi-industrial tests conducted in the retorts used for manufacturing carbon-disulphide gave good results. The aluminium-coated cast iron was never inferior to the conventional sulphurization-resistant cast iron.

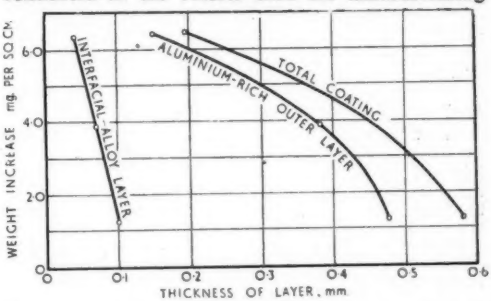


FIG. 5.—*Relationship between increase in sulphurization quantity and thickness of coating layer.*

In concluding this report, the Author expresses his thanks to Prof. Dr. I. Iitaka, Prof. Dr. M. Shiozawa, Mr. H. Nakai and Mr. T. Haga.

REFERENCES.

[1] P. T. Stroup and G. A. Purdy; *Metal Progress* **57**-1 (Jan., 1950).
[2] E. Yajima; *J.* of the Japan Inst. of Metals, **16**-6, (1952).

Chinese Steel Production

Work on projects scheduled in China's first five-year plan of industrial expansion began in 1953, but the draft of the plan sustained so many additions and revisions that the document itself was not published until this year. It provides for a striking advance in iron and steel production. Fifty years ago steel output in China was no more than 8,500 tons and by 1936 it had grown only to 400,000 tons, of which 364,000 tons was produced in North-east China, then occupied by the Japanese. According to figures broadcast by the Chinese themselves, steel output in 1943 was 900,000 tons; in 1949 it was 158,000 tons, and by 1952 it had grown to 1,350,000 tons. For 1957 the annual output is planned at 4,120,000 tons, with further expansion in the following years.

Conditional Aid

Revolving Fund for Industry

An explanatory leaflet from the Board of Trade sets out the details of the scheme under which manufacturers may apply for short-term loans for the purpose of increasing productive efficiency. The Fund was established as a part of the Conditional Aid programme, the terms of which are set out in an exchange of letters between the Foreign Secretary and the United States Ambassador reproduced in CMD 8776 (copies of this White Paper are obtainable from HM Stationery Office, price 6d. net). Extracts from the leaflet are as follow:

Amount Available for Loans

A sum of £700,000 has been allocated to the industrial part of the Fund. Repayments should maintain the Fund at a level which should avoid any interruption in the issue of new loans. Applications can therefore be made at any time until further notice. In order to spread the benefit of the Fund as widely as possible, applications should normally be limited to £30,000 but no fixed maximum or minimum has been laid down.

Projects Eligible for Consideration

In principle, any project which has as its object the raising of productive efficiency in industry is eligible for consideration except that loans cannot be made to finance building work other than minor alterations required solely to accommodate more-efficient machinery. Preference will be given to applications from small- and medium-size firms relating to projects which will yield a substantial and quick return in improved efficiency in the production of goods essential to home consumption, or for which there are good export prospects.

An increase in turnover is not enough, even though it may lead to lower unit costs by the wider spread of fixed overheads; in order to be eligible, the project must lead to greater efficiency in production. This may be achieved in a variety of ways, *e.g.*, by substituting the latest equipment for old types or for manual operations, by improving the balance of capacity at different stages of manufacture, by reorganizing layout or methods so as to reduce handling and unnecessary processes. Manufacturers who need independent advice (*e.g.*, from management or engineering consultants) as to the possibilities in these directions, may find the initial cost an obstacle; loans from the Fund for this purpose also can be considered in appropriate cases.

An improvement in productive efficiency made possible by the loan will usually lead to increased turnover calling for more working capital. While provision for this in the loan is not ruled out, it will normally be more appropriate for it to be obtained from other sources until the shortage can be made good out of profits.

Conditions of Loans

The principal conditions incorporated in loan agreements in accordance with the requirements of the White Paper are:

(*a*) The arrangements for repayment are subject to negotiation and will be based on the surplus expected to be available in successive years after taking into account of taxation, increased working capital requirements and other commitments. The period of the loan will thus depend on the circumstances of each case, but will be subject to a maximum of seven years for the completion of repayment.

(*b*) The rate of interest is 5 per cent., payable half yearly on the balance outstanding.

(*c*) Reasonable security is required, but the existence of a prior charge on the applicant's assets (*e.g.*, as security for an overdraft) does not necessarily preclude this.

(*d*) Progress reports are required during the period of the loan and, if necessary, for a short period beyond.

(*e*) Knowledge and experience gained as a result of the loan are to be made available to other industrialists likely to benefit. This would be arranged by the Board of Trade with due regard to the borrower's trading interests.

(*f*) Benefits of higher productivity resulting from the loan are to be shared equitably between the borrower, his workpeople and customers.

(*g*) The products must be sold under fully competitive conditions, *e.g.*, their price should not be subject to any agreement with other producers.

(*h*) The loan may be used only for the purposes specified in the agreement.

These and other details are subject to negotiation in the light of the circumstances of each project selected for assistance from the Fund.

How to Apply

Applications should take the form of a letter or memorandum giving the information asked for in a questionnaire; applications can be dealt with more quickly if six copies are supplied. All applications are considered by an independent committee which makes recommendations to the Board of Trade as to the projects to be assisted from the Fund and the terms on which individual loans are to be granted. Applications should be addressed to and further information may be obtained from:—Industries and Manufactures Department (Revolving Fund for Industry), Board of Trade, Horse Guards Avenue, London, S. W. 1.

Death of A. Watson

Mr. Arthur Watson, assistant managing director of Stanton Ironworks Company, Limited, died suddenly at Stanton last Thursday morning during the opening ceremony of the coke-oven plant extension with which he had been so closely connected. He was in his 63rd year.

Born in Glasgow and educated at Glasgow High School and the Royal Technical College, his first appointment at Stanton was in 1919, in the iron pipe department. From this he was moved to become personal assistant to the commercial manager, and later took charge of foundry sales. Mr. Watson was appointed manager, iron pipe department, in 1933; commercial manager, cast iron departments, in 1939; and assistant managing director, in 1940. Mr. Watson had been actively connected with many trade associations, and was, at the time of his death, chairman of the Cast Iron Segment Association and of the Cast Iron Pipe Association. He was also a past chairman of the Society of British Gas Industries, and was a member of the executive of the Joint Iron Council, Foundry Pig Iron Producers' Association, Cylinder and Refined Iron Association and the British Slag Federation. In addition, Mr. Watson was a Liveryman of the Worshipful Company of Founders.

Building in Prefabricated Concrete

New Foundry for Sterling Metals, Limited

To complete within a year a factory of 200,000 sq. ft. and considerable ancillary work—this was the challenge accepted by Beecham Buildings, Limited, Shipston-on-Stour (Warwicks). It has now been honoured. The factory, a foundry for Sterling Metals, Limited, is on a site adjoining the company's existing foundry at Nuneaton. It is claimed to be the largest prefabricated concrete building ever completed in Britain; a view of one of the bays is shown in Fig. 1.

The main block covers an area 267-ft. wide by 500 ft. long. It comprises a central span of 67 ft. running north and south, flanked on each side by two spans of 50 ft. These five spans are 28-ft. high from floor to eaves level. Running along the full length of the eastern side is a further span of 34 ft. which rises to a height of 40 ft. at eaves level.

From the north-eastern corner of the main block and from the high span, two spans each of 34 ft. extend northwards for a length of 217 ft. This extension is also 28 ft. to eaves level, except for one bay which adjoins the high span and rises to the same height; it will be devoted to the processing and storage of moulding sands and one of the spans is divided longitudinally by reinforced concrete retaining walls into a series of storage chambers.

Provision has been made over the entire area of the main block for carrying overhead travelling cranes of 5 tons capacity at 18 ft. above floor level. The internal columns, supporting the crane beams and the roof structure, are spaced longitudinally at 33-ft. 4-in. centres.

Roofing

The roofs of all spans are pitched at 22½ deg., the roof cladding consisting of aluminium-alloy sheeting, fixed to purlins at approximately 4-ft. 6-in. spacing, these in turn being carried on main roof principals which divide the 500-ft. length of the main block into thirty 16-ft. 8-in. bays. The roof principals of the internal spans are, therefore, carried alternately on the columns and at midspan on the crane beams. The columns in the external walls are spaced at 16-ft. 8-in. centres and directly carry the roof principals. Roof lighting in traditional patent glazing has been incorporated in all spans of the main block, the total roof glass being 30 per cent. of the floor area. The walls are of no-fines concrete 12-in. thick to a height of 8 ft. and were cast *in situ* between shuttering clamped to the columns. From a precast cill on the walls rise mullions which divide each bay into three vertical window lights, these filling in the remainder of the wall space up to eaves level. This belt of glazing, about 17-ft. high, runs continuously all round the building, interrupted only by the external columns, mullions, doorways, and two batteries of coke storage bunkers which are incorporated in the structure of the high span. Along the east side of the building there is an open stackyard and loading bay with overhead-crane gantry and private railway siding.

North of the foundry itself, work has begun on a group of ancillary buildings which will comprise foundry offices and laboratory, electrical sub-station, boiler house, compressor house, and an amenities block. On the north-west side the foundations are under way for a tool shop and patternshop of 50,000 sq. ft.

Principles of Construction

The structural framing and all walling elements, with the exception of the mass walling below window-cill level, are of precast reinforced concrete, produced at the builders' precast concrete works at Shipston-on-Stour. Like all this firm's buildings, the foundry was specially designed for the processes that it is to house, but it incorporates basic structural members designed for use in industrial buildings. To produce these types a wide range of permanent moulds is always held available—moulds for roof frames of various spans, moulds for heavier and lighter columns, moulds for window and walling units, crane beams, valley gutters, floor beams, etc., each mould being capable of producing considerable variety in dimension and detail within the overall envelope of the mould

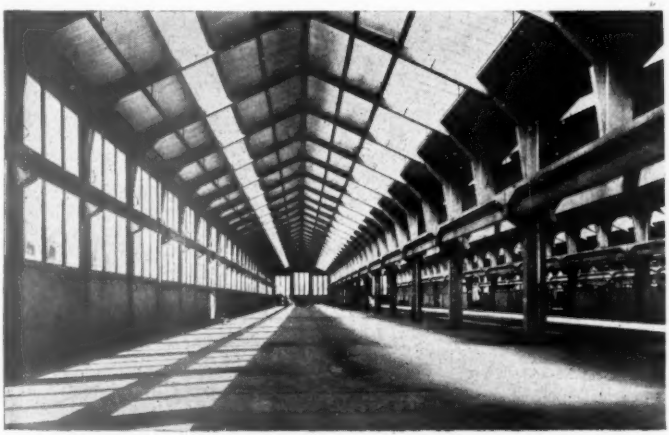


FIG. 1.—*Interior view of the new foundry for Sterling Metals, Limited, constructed in reinforced concrete by Beecham Buildings, Limited.*

FIG. 2.—*Coke-storage bunkers which were incorporated into otherwise standard structures.*

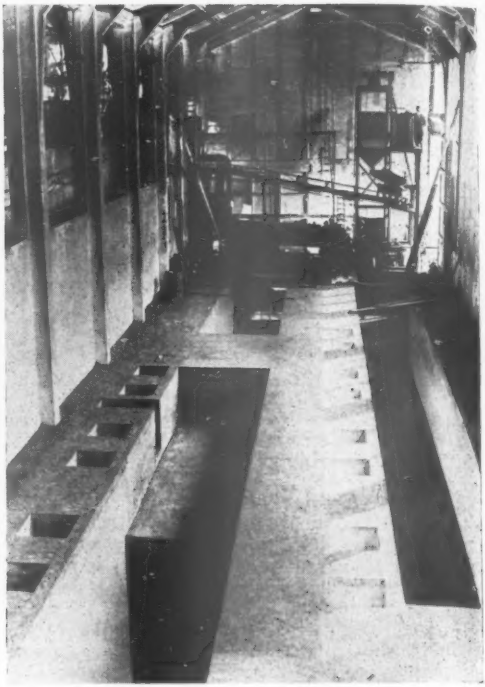


FIG. 3.—*Concrete-lined pitwork in the sand-treatment bay, with some equipment already installed.*

outline. Special units have to be designed and cast in special instances—a case in point is the range of coke bunkers (Fig. 2) which form an integral part of the structure of the foundry building—but these are kept to a minimum.

Considerable flexibility is, therefore, allowed to the designer, with economy of drawing-office time in detailing and in mould work. At an early stage mould loading is programmed and the flow of precast units to the stackyard commences and continues uninterruptedly. In the meantime, site works are commenced. In the case of the foundry, most of the concrete floor was laid prior to the erection of the superstructure, and pits (Fig. 3) were incorporated in the sand-treatment bay. Erection of the main block commenced in October, and delivery of components and erection was carried on without a break, in spite of the severe winter, until the building was completed.

At no time were more than 60 men employed on the site, and most of the erection was carried out by a gang of 10 men working with two cranes.

Chairman of the TUC

Many years of loyal union work have culminated in the appointment of Mr. Wilfred B. Beard as the new chairman of the Trades Union Congress. For 11 years before he became general secretary of the United Patternmakers' Association in 1941 he was organizer of the Lancashire and Cheshire district of the union. He has been a member of the TUC General Council since 1947. In 1953, Mr. Beard resigned in deference to union opinion from part-time membership of the Iron and Steel Board.

As chairman of the General Council's Education Committee he represents the TUC on several committees. He is a member of the Treasury Advisory Committee on the Development Areas and of the National Youth Employment Council. He also serves on the Executive Committee of the Confederation of Shipbuilding and Engineering Unions.

Peak Level of Employment

At the end of July, the number in civil employment in the UK, at 22,950,000, was the highest peacetime level on record. This was 50,000 more than at June 30 and 290,000 more than at the end of July, 1954. Between July 11 and August 15 there was an increase of 15,000 in unemployment, due mainly to the registration of school-leavers. Vacancies notified but still unfilled on July 27 were 473,000—90,000 more than a year previously and the highest number of vacancies outstanding since August, 1951.

The number of persons registered as unemployed on August 15 was 200,000, including 18,000 temporarily stopped. The proportion of the estimated total number of employees who were unemployed was 0.9 per cent., the same as in July, compared with 1.1 per cent. a year ago.

New Equipment

Unloading Ramp for Tipping Lorries

An aluminium unloading ramp capable of taking a 12-ton tipping lorry up to a height of 4 ft., yet light enough to be man-handled with ease, has recently been completed at the Bristol works of Frederick Braby & Company, Limited. Designed for stockpiling quartz, the ramp will reduce storage difficulties for Cornwall Mills, Limited, of Par, whose handling problem is aggravated by the fact that quartz is brought in only during the months when the Scandinavian ports of origin are ice-free.

If large quantities of ore or coal are unloaded for storage simply by tipping from lorries on to the ground, they occupy far more space than is economical. Unless expensive lifting gear is used, the stockpiles are low and spread over a large area. By backing the unloading tipper up quite a low ramp the height of the heaped material can be perhaps doubled.

The light-alloy ramp is of three-part construction, and consists of a 4-ft. high trestle supporting two ramps each made up of two extruded aluminium channels 2 ft. apart. Cross-pieces of flat strip, set on edge at 6-in. intervals and braced by ties, form the two wheel-tracks. The trestle is built up of channel and angle sections, with diagonal bracing for additional rigidity. All aluminium alloy extruded sections are in Noral 51SWP. alloy, conforming to British Standard, and were supplied by the Northern Aluminium Company, Limited.

When in use, the ramps are secured to the trestle by 1½-in. dia. steel pegs locating in holes in the steel top member of the trestle. Variations in lorry track width are provided for by a range of holes spaced 6 in. apart; overall track width can be varied in this way from 9 ft. to 6 ft., and a length of angle section used to tie the ramps at their lower ends has similar provision for adjustment.

For removal to a new position the whole structure can be dismantled in a matter of seconds. Since the overall weight of each ramp is only 6½ cwt., and the trestle is little over 4 cwt., four men can dismantle and erect without difficulty, and two men can move the dismantled parts with ease.

Oil-fired Portable Mould Dryer

A new oil-fired portable mould dryer shown in Fig. 1 has been introduced by Modern Furnaces & Stoves Limited, of Booth Street, Birmingham, 21, which has been designed to conform to all the requirements of the new Foundry Regulations. The dryer, which is entirely self-contained, discharges hot air only into the mould, at a temperature range of up to 500 deg. C. Temperature control is obtained by adjusting a screwed valve on the inlet side of the blowing fan, it being unnecessary to alter the burner setting. The simplicity of control enables the dryer to be operated in safety by any type of labour, and the large amount of hot air delivered ensures rapid heat penetration of the sand without the danger of burning.

The manufacturers' specification includes a 20-gallon oil tank which holds sufficient for 10 hours continuous drying and dispenses with the need for pipe-line extensions. The electrical equipment consists of two fans with totally-enclosed motors, a fused switch and three-pole plug and socket for cable connection. Thermal output from the dryer is 300,000 BTU per hour adjustable from 270 deg. C. at 500 cub. ft. of hot air per min. to 500 deg. C. at 270 cub. ft. per min. Gas oil or diesel oil is recommended as fuel, to eliminate the need of preheating. Mechanized skin drying can be obtained by mounting the dryer on a structure, blowing into a distributor hood and passing the moulds below on roller conveyors.

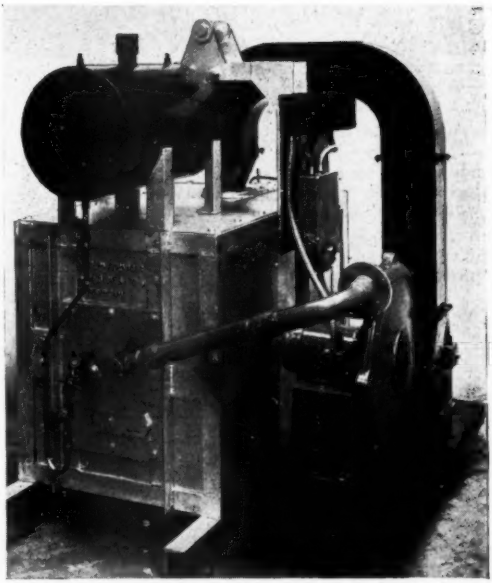


FIG. 1.—*Portable oil-fired mould dryer developed by Modern Furnaces and Stoves Limited.*

"Metica" Tubing

For the conveyance of highly corrosive liquids there have been in use for a considerable period tubes made in impervious carbon or graphite material which has an exceptional resistance to all types of corrosion. For applications where a high thermal conductivity is required, impervious graphite, with a thermal conductivity in excess of 60 BTU per hr. sq. ft. deg., F. per ft. can be recommended. Where strength combined with resistance to corrosion is demanded, impervious carbon, with minimum ultimate strengths of 5,000 lb. transverse, 15,000 lb. compressive, 3,000 lb, tensile, and 3,500 lb. per sq. in. shear offers excellent properties. The uses for such a material, which is easily machinable and offers itself readily in extrusion, are numerous, but this material is of a very brittle nature, and it can be broken by being dropped, or being accidentally tapped with a spanner.

Talbot Stead Tube Company, Limited, Green Lane, Walsall, has perfected a process of covering these tubes with a metallic sheath known as "Metica" tubing, to meet operating conditions, and Patents have been filed. This external metal might be carbon steel, alloy or stainless tubing, or some other material such as copper, brass, etc. The employment of this metal-protected tubing provides maximum safety with both higher pressures and higher temperatures than are normally used; moreover, both types of tubing are resistant to alkali. Methods of joining the pipes together with tees and elbows have been devised.

Company News

E. CHALMERS & COMPANY, LIMITED, non-ferrous ingot manufacturers and scrap-metal merchants, of Edinburgh. —Application has been made to the CIC for a one-for-one ordinary scrip issue.

WESTINGHOUSE BRAKE & SIGNAL COMPANY, LIMITED —Treasury consent has been granted to the company's application to borrow from its bankers for purposes including the proposed acquisition of Douglas (Kingswood), Limited, engineers, etc., of Bristol.

RIPPINGILLES, LIMITED, engineers and stove makers, of Birmingham—With a view to easing production problems, the directors have arranged for the purchase of a factory in Lancashire, Mr. A. E. Thorpe, the chairman, told shareholders at the company's meeting at Birmingham.

JAMES HOWDEN & COMPANY, LIMITED, marine and general engineers, boilermakers, etc., of Glasgow—A final ordinary dividend of 20 per cent. is recommended to make 25 per cent., less tax, for the year to April 30, or an equivalent rise of 6¼ per cent. For the previous year an interim of 7½ per cent. on £546,000 capital was followed by a final of 15 per cent. on the present capital of £1,092,000, as doubled by a one-for-one scrip issue.

ENGLISH ELECTRIC COMPANY, LIMITED—Underwriting is being arranged by Lazard Bros. & Company, Limited, of an offer of 3,805,430 ordinary shares of £1 each which will be made to ordinary stockholders by way of rights at 60s. per share in the proportion of one new share for every £3 of ordinary stock held on September 1, 1955. The stock into which the new shares will be converted when fully paid will rank for any future dividends.

VICKERS, LIMITED—An interim dividend of 2½ per cent. in respect of 1955, as for the previous year but payable on more capital, is declared by the company. The net UK tax rate applicable is 8s. 4d. The 1954 interim was on £24,630,968 ordinary and there was a final of 6 per cent. on £27,709,839 after the rights issue at 27s. 6d. per £1 share in August, 1954. Further capital of approximately £1,517,400 has been issued in connection with the acquisition of the balance of capital in Powers-Samas Accounting Machines, Limited.

RICHARDSONS, WESTGARTH & COMPANY, LIMITED—Treasury consent has been obtained for an issue of 1,665,488 ordinary shares of 5s. each. A one-for-five rights issue will require 1,415,488 of the shares and the remaining 250,000 will be offered to employees at the same price of 12s. 6d. per share. Proceeds will be expended on capital equipment to maintain the works plant to modern standards and to provide additional facilities in the way of buildings and machine tools to enable the company to manufacture the larger plants now required by customers.

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED—A group trading profit of £6,500,000 unaudited is announced in the company's progress report for the six months to June 30, 1955. For the corresponding half-year of 1954 the profit was £5,480,000, and for the half-year to December 31, 1954, £6,260,000. Value of output, total invoicing (excluding inter-trading) amounted to £58,600,000 for the 1955 half-year, compared with £56,900,000 for the six months to June, 1954, and £64,000,000 for the second half of 1954. As previously announced, a second interim of 2½ per cent. was declared on £25,000,000 ordinary capital, which followed a first interim of 2½ per cent. on £19,827,587 capital.

New Patents

(Copies of complete specifications are obtainable from the Patent Office Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3/-.)

736,624. General Motors Corporation, Grand Boulevard, Detroit, Michigan, USA.

Gas-fired furnaces for use in the production of shell moulds. The furnace has a tunnel of refractory material which is open at both ends. Rails are laid through the tunnel, and a row of radiant-heat gas burners is placed beneath the rails on the floor. A wheeled cart is adapted to run on the rails and carry a metal pattern which has a layer of sand/resin mixture. The cart is arranged to be open in the centre to allow the heat to pass through.

737,043. Imperial Chemical Industries, Limited, Millbank, London, S.W.1.

An improvement in arc-melting furnaces which incorporate a non-consumable electrode adapted for movement relative to part of the furnace through a gas seal. A scraping device is provided immediately next to the seal, which is adapted to remove metallic deposits from the surface of the electrode. The furnace is of the type used for high melting point reactive metals, *viz.*, titanium, zirconium, molybdenum, thorium, hafnium, tantalum, chromium, and alloys.

737,064. Babcock & Wilcox Company, 161, East 42nd Street, New York, USA.

Continuous casting of metal of both ferrous and non-ferrous and high-temperature alloys. The invention has a protective non-oxidizing atmosphere about the metal delivered to the mould. Cooling liquid is discharged against the embryo casting issuing from the mould. The mould is guided and restrained as it is withdrawn, and the level of the molten metal in the mould is varied by cyclically operating the withdrawing mechanism. This method is particularly useful in casting carbon and alloy steels.

737,074. General Motors Corporation, Grand Boulevard, Detroit, Michigan, USA.

An aluminium alloy suitable for use as a bearing material. It consists of: 0.2 to 10 per cent. silicon, 0.1 to 5 per cent. bismuth, 0.1 to 0.8 per cent. chromium, the balance apart from impurities being aluminium.

737,143. Deutsche Edelstahlwerke Aktiengesellschaft, 578 Gladbacherstrasse, Krefeld, Germany.

An invention for the production of shell moulds which claims to increase output. The method consists of heating patterns by passing them through an oven, bringing them into working operation with at least one pressure heat, delivering the moulding material by compressed-air pressure to the head and discharging the material on to the pattern. The pattern and the head are then separated and the pattern is tilted to remove excess material which has not adhered to the pattern. The apparatus required for this process is described and illustrated in the Patent in great detail.

737,153. Aluminium Laboratories, Limited, 1800 Sun Life Building, Montreal, 2, Canada.

A method of casting aluminium. Molten aluminium is transferred to a mould from a furnace. The molten metal is passed through at least one glass-cloth filter between the point of exit from the furnace and solidification in the mould.

News in Brief

THE SECOND INTERNATIONAL AUTOMATION EXHIBITION is to be held at the Navy Pier, Chicago, from November 14 to 17.

CHANCE BROS., LIMITED, announce that their London offices are now at 29/30, St. James's Street, London, S.W.1. Telephone: WHItehall 6002.

BORAX & CHEMICALS, LIMITED, announce that the address of their Birmingham office is now 15, Carrs Lane, Birmingham, 4. (Telephone: Midland 1159.)

S. WHITEHEAD (IRONFOUNDERS), LIMITED, Broadheath, Altrincham, Cheshire, have had plans prepared for the construction of a foundry at Atlantic Street Trading Estate, Altrincham.

BERRYS FOUNDRY (1949), LIMITED, Brownroyd Hill Foundry, Low Moor, Yorks, have had new premises planned for erection at Wakefield Road Industrial Estate, Brighouse, Yorks.

MOST OF THE coke-fired furnaces at the factory of Charles Carr, Limited, Birmingham, are being converted to oil. Oil-storage tanks are being installed and slung overhead to operate gravity feed.

IN CONNECTION with the Ogston Reservoir Scheme, the Staveley Iron and Chemical Company, Limited, near Chesterfield, have supplied over 9,000 yards of 21-in. dia., and over 1,000 yards of 18-in. dia. sand spun pipes.

HOLMAN BROS., LIMITED, exhibits at the British Trade Fair, being held in Copenhagen from September 29 to October 16, include a wide range of general-purpose robust pneumatic tools for use on ferrous materials.

A CONTRACT worth £1,000,000 has been secured by Yarrow & Company, Limited, engineers, Glasgow, who are to supply three land boilers and equipment for the new steam power station being built at Pretoria, South Africa.

UNDER THE AUSPICES of the *Associazione Italiana di Metallurgia*, the first national convention on powder metallurgy will be held in Turin on October 7. Details are available from the *Associazione*, via Moscova 16, Milano.

THE Federation of Light Metal Smelters announces that its members' average selling prices for August, to the nearest 10s., have been calculated to be: L M 1, £188 per ton; L M 2, £189 10s.; L M 4, £192; L M 6, £196.

A SYMPOSIUM on the "Use and Welding of Aluminium in Shipbuilding," is to be held in the Weir Lecture Hall of the Institution of Naval Architects, 10, Upper Belgrave Street, London, S.W.1, on December 7 and 8.

MEMBERS OF ALL GRADES of the Institute of British Foundrymen are reminded that the Institute's official membership badge can be supplied at a charge of 3s. 0d. The badge is engraved with the member's name and year of joining.

TYNESIDE SHIPYARDS will be closed on December 26 and 27 this year, as Christmas Day falls on a Sunday, and at the New Year they will close on January 2. A similar arrangement was last week agreed by employers and workers at Wear yards.

TO HONOUR THE BATTLE OF BRITAIN, September 18, the chairman and directors of Rolls-Royce, Limited, invited members of the public to view the Battle of Britain memorial window, which is situated in the front hall of the Nightingale Road works, Derby.

A ROMAN BURIAL URN has been found by two members of the Rotherham Historical Association in excavations for extensions to the works of Steel, Peech & Tozer, Limited, at Brinsworth, near Rotherham. The site is near to that of the Roman fort at Templeborough.

THIRTY-SIX GRAIN SILOS made of aluminium, each of 100-ton capacity and believed to comprise the largest single installation of its class outside the United States, have been added to the grain-storage facilities at Twyford Mill, Limited, at Adderbury near Banbury.

SHEFFIELD INDUSTRIALISTS have been asked by the Corporation Transport Committee to stagger working hours to help overcome transport difficulties largely due to staff shortage. Sheffield had a system of staggering during the war and for some time afterwards.

THE 29th annual congress of the French Foundrymen's Association will be held at Charleville from May 24 to 26, 1956. Members of the Institute of British Foundrymen are cordially invited to attend. Those interested should communicate with the secretary.

THE GRINDING WHEEL which disintegrated and killed a die-sinker at the Blackheath Stamping Company's works on September 10 was four times the size normally used, it was stated at a Halesowen inquest on September 19. The jury returned a verdict of "Accidental death."

THE INSTITUTE OF INDUSTRIAL SUPERVISORS has arranged an extremely large number of weekend residential courses. No fewer than 47 are listed and take place at four centres in Scotland and England. Details are available from the Institute, at 24, Albert Street, Birmingham 4.

THE DEPARTMENT OF INDUSTRIAL METALLURGY, UNIVERSITY OF BIRMINGHAM, has issued a brochure on the graduate course of metallurgy which the University provides. Further information and forms of application may be obtained from the Registrar of the University, Edgbaston, Birmingham, 15.

AT THE FUEL EFFICIENCY EXHIBITION, to be held in the City Hall, Manchester, from October 12 to 22, Babcock & Wilcox, Limited, will occupy a composite stand (18 and 28) together with associated companies, Edwin Danks & Company (Oldbury), Limited, and Spencer-Bonecourt-Clarkson, Limited.

OUTPUT OF STEEL in the United States in August, at 9,583,000 net tons, was the highest figure for that month on record, the American Iron and Steel Institute reports. The previous August record was in 1953, when 9,405,580 tons of ingots and steel for castings were produced. In August, 1954, the figure was 6,666,907 tons.

PARKER FOUNDRY (1929), LIMITED, Derby, was visited by several hundred people on the occasion of the Open Day, on September 10. In the morning the visitors were able to see the foundry at work, and in the afternoon exhibits by employees were shown in the canteen. These comprised photographic, horticultural, and cage-bird sections.

WORK is now nearing completion of the new hydraulic machinery laboratory, which will be one of the most advanced research buildings of its kind in the world, at the new town of East Kilbride, near Glasgow. The new building is part of the Mechanical Engineering Research Laboratory, which is under the direction of Dr. D. G. Sopwith.

ON SEPTEMBER 3, Flavels of Leamington held their 15th annual show of the horticultural section of the

News in Brief

Social and Athletic Club. There was a record number of 425 entries in the various sections which included horticulture, handicrafts, cookery, art, models, photography and advertising. A dance was held in the evening in the works canteen.

ALLIED IRONFOUNDERS, LIMITED, offer a comprehensive and unusual display of space-heating, water-heating, cooking appliances, luxury and low-cost baths on stands 658 and 659 at the Building Exhibition, to be held at Olympia, London, November 16 to 30. The firm's subsidiary, Aga Heat, Limited, has a separate display on stands 5 and 6, row A.

A PENSION SCHEME recently introduced by Victoria Foundries (Alton), Limited, has been accepted by nearly all the employees, features being a death gratuity, the entire cost of which is borne by the firm, a pension payable at 65 that is partly contributory and a unit scheme of payments to give some security against the declining value in money.

AT THE BRITISH EXHIBITION in Copenhagen, Herbert Morris, Limited, of Loughborough, will exhibit selections of their small products. These will include triple-gear pulley-blocks, electric chain hoists, travelling trolleys, elevating trucks, and sectional models of triple-gear pulley-blocks. The Exhibition will be open from September 29 to October 16.

IT WAS ANNOUNCED on September 15, that R. S. Dalgleish, of Newcastle, have ordered a 14,000-ton d.w. ore carrier to be built by Smiths Dock Company, Limited, South Bank. This is the first new ship ordered by the concern for some 20 years, though their existing fleet is made up of war-time tonnage acquired from the Ministry of War Transport.

CONSENT OF THE TREASURY has been obtained to a proposal by the Steetley Company, Limited, makers of refractories, to increase the capital to £5,000,000 by the creation of 2,000,000 new ordinary shares of £1 each. The directors propose to issue 925,791 of the new shares and offer them to shareholders on September 9 at 43s. a share on a one-for-two basis.

COLT VENTILATION, LIMITED, Surbiton, Surrey, have devoted a large section of their stand (K. 231) at the Building Trades' Exhibition (November 16 to 30) to the display of their new "Two-Way" fan. This ventilator is claimed to be the only fan in the world which *simultaneously* provides fresh-air inlet and also extracts foul air from within a building.

IN CONJUNCTION with Murugappa & Sons, Madras, Tube Investments, Limited, has formed a new company, Tube Products of India, Limited, for the manufacture, fabrication, and manipulation of electric resistance welded-steel tubes. The new company has an initial registered capital of Rs.20,000,000; and a building site of 80 acres has been acquired near Madras.

THE BIRMINGHAM BRANCH of the Institute of Materials Handling is organizing a demonstration of handling techniques on October 6 under the title "Simple conveying and controls with ancillary equipment." It is stated that some of the equipment is of the kind that could usefully be introduced into the smallest factory, warehouse or store, and that some is notably inexpensive.

FOUR GERMAN YOUTHS, apprentices from the firm of Hüttenwerk Rheinhausen A.G., near Duisburg, have started work at the Steel, Peech & Tozer branch of the United Steel Companies, Limited. They are unpaid and are working under an exchange scheme with the Rotherham firm for three months. The Germans are sharing home life with four Steel, Peech & Tozer apprentices.

WILLIAM GIBSON, of Sydney, New South Wales, has presented to the Australian (Victoria) branch of the Institute of British Foundrymen the sum of £250 to found the award of a bronze medal to be made annually to the most outstanding student in foundry engineering or technology. The Council of the Australian (Victoria) branch have accepted this presentation with great satisfaction and appreciation.

A SYMPOSIUM on "Mechanism of Phase Transformations in Metals" is being organized by the metal-physics committee of the Institute of Metals. It will be held in the lecture theatre of the Royal Institution, Albemarle Street, London, W.1, on Wednesday, November 9. Those wishing to attend should apply for a programme and registration form to the secretary, Institute of Metals, 4, Grosvenor Gardens, London, S.W.1.

A COMPREHENSIVE display by British Resin Products, Limited, and British Geon, Limited, at the British Exhibition in Copenhagen (September 29 to October 16), is thought to be unique in that it has been specially designed to be demountable. It is made up of sturdy units built and crated in this country for reassembly in Copenhagen. After the exhibition there, the stand will be repacked to await further use at future overseas exhibitions.

A RECENT outbreak of fire at the works of Wm. Aske & Company, Limited, makers of corebinders, etc., was fortunately confined to an isolated out-building in which the heat-treatment of certain raw materials was carried out prior to their being pumped into the main buildings. Although damage was severe, alternative arrangements were quickly put into operation and thus there is no interruption in normal business of the company.

LAST MONTH witnessed a further sharp recovery in United Kingdom exports, which was accompanied by only a slight rise in imports. The overseas trade gap was thus further reduced. Provisional figures show the value of exports in August at £264,200,000, an increase of £41,200,000 on the month. Commenting on the month's trade, the Board of Trade states that the August figures were still affected by the transport strikes which ended at the beginning of July and that it is difficult to assess the underlying trends of the figures.

EXHIBITS of Keith Blackman, Limited, stand 58, ground floor, Grand Hall, of the Fuel Efficiency Exhibition, Manchester, October 12 to 22, include multivane fans for handling relatively clean gases at temperatures up to 650 to 750 deg. F.; cast-iron blowers for supplying air blast; low- and medium-pressure oil- and gas-fired furnaces; a 24-in. high-efficiency blower for such applications as cupola blowing; series I, P.V.C. fans for fume-removal purposes; and a selection of the firm's industrial gas apparatus and heating apparatus for electricity and steam.

A CONFERENCE on "Electric Overhead Cranes," organized by the Plant Engineering Division of the British Iron and Steel Research Association, will be held at the Hotel Majestic, Harrogate, on October 5 and 6, under the chairmanship of Mr. W. F. Cartwright, assistant managing director and general manager (steel division) of the Steel Company of Wales, Limited. Full particulars may be obtained from the technical secretary, plant engineering divi-

sion, BISRA, 140, Battersea Park Road, London, S.W.11.

SIDNEY FLAVEL & COMPANY, LIMITED, at the Building Exhibition (Olympia, November 16 to 30) on stand 266 in the National Hall are exhibiting a wide range of products consisting mainly of solid-fuel and space-heating appliances. Flavels claim to have pioneered the use of smokeless fuel by producing the first smokeless-fuel grate over 25 years ago and the appliances shown are a direct development of the original principles. Models include solid-fuel grates, boiler sets, gas fires, a clothes dryer, the new "Cotswold" solid-fuel cooker and gas water-heaters.

THE FIRST of 120,000 letters of invitation from British Industries Fair, Limited, are on their way to Australia and New Zealand, the Far East, Africa, and South America. The remainder of the letters, which are prepared in nine languages, will be sent over the next two months to buyers in 100 countries. With each letter is a folder of advance information about the BIF, which will be held at Earls Court, London, from February 22 to March 2, and simultaneously at Olympia, London, and Castle Bromwich, Birmingham, from April 23 to May 4.

Mr. D. C. JEMMETT, chairman and managing director of Manley & Regulus, Limited, told shareholders at the annual general meeting in Birmingham on September 21 that the company intends to add to its range of products and that orders have been placed for additional plant to the value of some £20,000. It was hoped that at least a portion of this new plant would soon be in production, he said. The company had a healthy order book and in the absence of a serious recession in prices of raw material, the prospects for trade were encouraging.

DAVY AND UNITED ENGINEERING COMPANY, LIMITED, Sheffield, state that they hold big orders from leading British steel manufacturers as well as for new rolling mills in Norway, Sweden, Italy, Australia and India. Mr. D. F. Campbell, the chairman, says that competition from other countries in the export field is becoming more severe, and also that several of the projects in which the company is interested involve questions of payment on deferred terms. He foresees that shortage of thin, flat, rolled steel in the United Kingdom will mean more steelworks expansion.

WHEN the steel expansion programmes, including the building of British plant, are completed, India's annual steel production will reach 4,620,000 tons. This announcement was made in the Indian Parliament in reply to a question, and it was further stated that targets of saleable steel per year are as follow:—Tata Iron & Steel Company, Limited, 1,500,000 tons; Indian Iron & Steel Company, Limited, 800,000 tons; Mysore Iron & Steel Works, 100,000 tons; Rourkela steel plant (German), 720,000 tons; Bhilai steel plant (Russian), 750,000 tons; British steel plant 750,000 tons.

A MAJOR STEP in the settlement of the problems of African advancement on the Rhodesian Copper-belt, which have been causing discontent among African and European workers alike, with consequent disruptions in production, has been reached with the signing of an agreement between the Rhodesian Selection Trust and the European Mineworkers' Union. A broadly similar agreement was reached by the other major copper producer, the Anglo-American group, at the end of July, which, according to its chairman, ended the deadlock on American advancement as far as his company was concerned.

ON SEPTEMBER 16, Head, Wrightson & Company, Limited, were again able to demonstrate how their geographical location on the River Tees enables them to deliver completed dock gates direct from their constructional shops to site, when the first leaf of a new pair of lock gates, built for the British Transport Commission, Humber Ports, was launched. These gates are for the 90-ft. wide outer entrance to Immingham Dock and the approximate weight of each leaf is 190 tons. The new welded gates replace a pair of riveted wrought-iron gates which the firm installed in the same position in 1908.

THE President of the Board of Trade (Mr. Peter Thorneycroft) and his Permanent Secretary (Sir Frank Lee) will attend the opening of the British Exhibition in Copenhagen today. The Minister of State (Mr. A. R. W. Low) is also expected to visit the exhibition before it closes on October 16. The Board of Trade have an inquiry stand staffed by members of the commercial department of the British Embassy who will be able to give visitors detailed information about UK manufacturers, agencies, export credit guarantees, tariffs, and import and export licences. The stand also seeks to give an impression of Britain's achievement in the field of domestic design.

AT THE MOTOR SHOW, which is to be held at Earls Court, October 19 to 29, the Pyrene Company, Limited, on stand 331, will be showing their new Pyrene PDU 25 dry chemical extinguisher. Operated in the upright position, and brought into action by striking a plunger in the top-cap, the appliance extinguishes oil and spirit fires with a discharge of dry chemical powder. A special "squeeze-grip" release valve fitted to a short length of high-pressure hose permits efficient control of the discharge. An adaptation of the extinguisher has been developed to meet the particular hazards of fires involving such metals as sodium, calcium, magnesium and aluminium. The Metal Finishing division of the company will feature a number of their special processes for prevention of rust and corrosion.

AN IMPORTANT ORDER has recently been placed by the South African Iron & Steel Industrial Corporation, Limited (ISCOR), with D. Drury & Company, Limited (agents for the Electric Furnace Company, Limited, of Weybridge), for a 60-65 ton Efco-Heroult arc furnace rated at 15,000 kva. This unit will be several times larger than any furnace so far installed in the Union and in fact very few furnaces of this capacity have been installed outside the North American continent. The complete equipment will be supplied by Electric Furnace Company, Limited, the furnace itself being built in South Africa by the East Rand Engineering Company under the supervision of the Electric Furnace Company's agents. The main electrical equipment will be manufactured in England by the English Electric Company, Limited.

A NUMBER OF Northern Ireland firms are being asked if they can make use of the old-established Falls Foundry, and its labour force of 560. The firms are being approached by the committee of back-bench Unionist M.P.s and Trades Union leaders which has been formed to ensure that every possible effort is made to continue the foundry which closes early next year. Several engineering and foundry firms throughout the United Kingdom will also be approached to ascertain if they would be interested in taking over the foundry on reduced terms. Concurrently the Industrial Development Branch of the Northern Ireland Ministry of Commerce is also trying to acquire new tenants for the foundry. The announcement about the closure of the Falls Foundry was made last month by the owners —Fairbairn Lawson Combe Barbour, Limited—who for financial reasons intends to confine operations to Leeds.

Personal

Mr. G. AINSCOW, secretary to Vaughan Crane Company, Limited, has been appointed to the Board. He will continue to act as secretary.

Mr. A. W. JEFFREY, a director of Alan Carlton & Company, Limited, diecasters, of Glasgow, is leaving next month on an extended business tour of the United States.

F. H. (NEWCASTLE), LIMITED, Newcastle-upon-Tyne, announce the appointment to the Board, as managing director, of Mr. S. G. W. CAMBERS, previously general manager.

Mr. G. WILSON, chairman and managing director of Raleigh Industries, Limited, and Mr. E. E. BAKER, who is export director to the company, are on two separate tours to America, Canada, and Mexico.

Mr. G. GIDEON HOUSTON has been appointed an additional representative in the West Riding of Marsh Bros. & Company, Limited, steelmakers and engineers' tool manufacturers, of Sheffield. He will also pay regular visits to the North-East Coast area.

MR. J. G. DAWSON has been appointed manager of the experimental department of F. Perkins, Limited, of Peterborough. He was chief engineer at the Shell organization's Thornton Research Centre. For some time, he was an aero-engine development engineer with Rolls-Royce, Limited, Derby.

Mr. J. W. WHIMPENNY, a director and general manager of W. H. Dorman & Company, Limited, manufacturing engineers and diesel-engine makers, of Stafford, is making a 27,000-mile tour of Africa, Australia, and the Far and Middle East. He is travelling by air and will return to Stafford in November.

THE British Iron and Steel Federation has appointed Mr. AUBREY JONES as its general director. At the beginning of last year Mr. Jones became economic director of the Federation, having served as assistant director since 1950. The post of general director of the BISF is a new one. Mr. Jones has been Conservative MP for the Hall Green Division of Birmingham since 1950.

Mr. RONALD W. HARRIS, works manager of the Yale & Towne Manufacturing Company, Limited, lock and hardware section, British divisions, and Mr. ALBERT E. LANGFORD, chief designer of the materials-handling section, Wednesfield, have left for a visit to America. Mr. Harris is to study production techniques at the American and Canadian plants of the company and Mr. Langford is to make a special enquiry into certain developments in materials handling. Both will visit the parent company in New York.

Mr. F. PICKWORTH is to succeed Lt.-Gen. Sir RONALD WEEKS as chairman of the English Steel Corporation, Limited, Sheffield, with effect from October 1. Sir Ronald is chairman of Vickers, Limited, which has a considerable holding in English Steel, and Mr. Pickworth, who is to relinquish his present office of managing director of the Corporation, will also join the Board of Vickers. The English Steel Corporation's new managing director will be Mr. W. D. PUGH, the assistant managing director.

Lt.-Gen. Sir JOHN ELDRIDGE, Controller of Munitions, Major-Gen. F. W. GORDON HALL, director-general of fighting vehicles, and Mr. E. W. DITCHBURN, director of fighting-vehicle production, Ministry of Supply, paid a two-day visit to Sheffield last week to inspect processes connected with the work of their departments. They visited the works of Hadfields, Limited, the Steel, Peech & Tozer branch of the United Steel Companies, Limited, the English Steel Corporation, Limited, and William Jessop & Sons, Limited.

Changes in the sales organization of the balance division of Geo. Salter & Company, Limited, West Bromwich, designed to provide additional facilities in the sales section and to assist the allocation of production supplies between the home and export markets, are announced. Mr. J. H. WALTER becomes general sales manager, responsible for the smooth working of both home and export sections. Mr. C. P. TURNBULL, formerly with Thomas French & Sons, Limited, Manchester, has been appointed export sales manager, and Mr. T. KENNEDY joins the company from J. Goddard & Sons, Limited, as home sales manager.

Mr. A. J. BRIGHT has been appointed to take charge of the costs and statistics department of Richard Thomas & Baldwins, Limited, under the control of the chief accountant. Dr. P. M. MACNAIR has been designated education officer (technical). Mr. H. SCRIVEN, deputy chief engineer of the RTB Panteg section, has been appointed chief engineer in succession to Mr. W. R. MARCHANT, who has reached retirement age, but is continuing for the time being as Mr. Scriven's assistant. Mr. A. H. HARVEY, who retired recently as chief civil engineer at Ebbw Vale, has been succeeded by his son, Mr. H. C. HARVEY, formerly his assistant. Mr. L. C. BULL and Mr. G. PLAYER have been appointed junior assistant managers of the open-hearth and Bessemer departments, respectively, at Ebbw Vale.

Obituary

The death has occurred of Mr. C. A. SCOTT, who was for many years chief erection engineer in the employ of Efco, Limited.

The death has occurred, at the age of 82, of Mr. PERCIVAL WADDAMS PETTER, who with his twin brother, Sir Ernest Petter, was joint designer and builder in 1895 of what they believed was the first internal-combustion-engined car in Britain. Mr. Petter and his brother founded the engineering firm of Petters, Limited, Yeovil, which turned from making oil engines to the manufacture of aeroplane engines and then aircraft. Mr. Petter eventually became vice-chairman of the Westland Aircraft Company, Limited.

MR. H. A. CRUSE, a director of the Westinghouse Brake & Signal Company, Limited, died on Sept. 18. Mr. Cruse retired from his executive post as general works manager in December last year, after 53 years' service with the company. He was appointed a director in 1944. Mayor of Chippenham for three years, Mr. Cruse also served several terms of office as president of the Engineering and Allied Employers' West of England Association, and was a member of the management board of the Engineering and Allied Employers' National Federation.

MR. EDMUND SAYERS, who, until he retired in 1953, was manager of the aero-equipment sales department at Coventry of the British Thomson-Houston Company, Limited, died on Sept. 18 at the age of 70. Mr. Sayers travelled abroad extensively for the company, and was selected to represent aircraft accessory manufacturers when a party of British executives visited aircraft establishments in the US and Canada in 1951, at the invitation of the American aircraft industry. He also served as deputy chairman of the Accessories Committee and a member of the council of the Society of British Aircraft Constructors.

PIPE LININGS

Examples of another of the many uses for

REFRACTORY CONCRETE

Refractory concrete-lined goose necks in position on blast furnace from bustle pipe to tuyere

A battery of refractory concrete-lined ascension pipes in service

Not only because of its great economy and ease of placing, but, being completely non-spalling and highly resistant to scour, it forms a really lasting non-collapsible rigid lining for foul mains, ascension pipes, bustle pipes, and similar hard duty applications.

REFRACTORY AND INSULATING CONCRETE

We will gladly forward on request a list of suppliers of crushed firebrick and other refractory and insulating aggregates, and of manufacturers of ready-prepared castable mixes incorporating CIMENT FONDU, to which only water need be added to make REFRACTORY CONCRETE.

Coke oven ascension pipes showing refractory concrete lining

REFRACTORY CONCRETE

The adaptable Refractory material made with crushed firebrick and CIMENT FONDU

CIMENT FONDU
Regd Trade Mark
ALUMINOUS CEMENT

CONCRETE ROCK-HARD WITHIN ONE DAY

Ciment Fondu is manufactured by

LAFARGE ALUMINOUS CEMENT COMPANY LIMITED

73 BROOK STREET, LONDON, W.1 Telephone MAYfair 8546

You are invited to write for further details and photographic examples

AP 3-1248

Raw Material Markets

Iron and Steel

Acceleration of pig-iron production is still a primary objective of the industry. Some progress in this direction can already be recorded, and if the aggregate output has not yet been restored to pre-holiday dimensions, the supply is steadily improving and more blast furnaces will soon be at work. To some extent the apprehensions of foundrymen have been appeased, but makers of special castings are still pressing for larger tonnages of low- and medium-phosphorus iron. Hematite production is on a better scale, and supplies of common foundry iron appear to be in balance with current requirements.

The supply position at the re-rolling mills is easier; deliveries of home produced re-rolling blooms, billets, and slabs during the first seven months of this year have been running at a rate nearly 20 per cent. in excess of the tonnages provided in the corresponding period of last year, while imports have more than doubled. The mills, of course, are very much busier and their requirements have increased. A year ago re-rollers were looking for work. Now they have a glut of orders of both domestic and foreign origin, and as production is no longer jeopardized by a lack of semi-finished steel capacity, working is the rule rather than the exception.

It is apparent that the demand for all classes of finished steel is unabated and in relation to sheets, strip, wire, and constructional material has far exceeded the most optimistic estimates. The motor, engineering, and shipbuilding industries are absorbing such large tonnages that exports have been curtailed and bookings severely restricted.

Non-ferrous Metals

Lead markets in the United States on Friday were surprised by the sudden action of the St. Joseph Lead Company in raising its price by ¼ cent to 15¼ cents. Other major producers held back pending a study of the market situation. Reaction in London on Monday was immediate. Second half September lead jumped 32s. 6d. a ton to reach £108 7s. 6d., while forward metal gained 30s. and, at £108 2s. 6d., reached its highest level since the resumption of free dealings in October, 1952.

Copper in London, on the other hand, slumped somewhat at the beginning of this week following the weakening of Wall Street markets which seemed to have been touched off by the illness of the President. There has also been a degree of unsettlement with the market awaiting official confirmation of the rejection of the petition to release copper from the US stockpile, which the copper and brass using industries themselves have indicated as almost certain to follow. Observers feel that the invitation of the Board of Trade for tenders for the balance of its electrolytic copper stocks constitutes only a minor factor in the price fall. These stocks amount to about 13,000 tons and will be disposed of over a five-month period beginning in November.

Another factor which may have only slight influence on the copper price was the strike declared at the end of last week at Anaconda's Chuquicamata copper plant in Chile. The strike concerned the company's clerical staff rather than the miners, who stopped work in sympathy.

The Singapore, London, and New York tin markets, after being steady all last week, assumed a softer tone following the report that the Penang smelter strike, due to begin on Tuesday, may not materialize. It is rumoured that the dispute is to be referred to the Penang Labour Office because of the present deadlock in negotiations. Meanwhile, buyers are holding off making purchases and the amount of tin changing hands is relatively small.

Demand for lead and zinc here is moderate and on the other side of the Atlantic irregular, although orders for October and November deliveries are building up satisfactorily.

Official metal prices were as follow:—

COPPER, Standard—*Cash*: September 22, £380 10s. to £381 10s.; September 23, £378 10s. to £379; September 26, £374 to £376; September 27, £372 to £373; September 28, £374 to £374 10s.

Three Months: September 22, £378 to £379; September 23, £375 to £376; September 26, £372 to £373; September 27, £370 to £371; September 28, £371 to £371 10s.

TIN, Standard—*Cash*: September 22, £755 to £756; September 23, £756 to £756 10s.; September 26, £751 to £751 10s.; September 27, £747 10s. to £748; September 28, £751 to £751 10s.

Three Months: September 22, £756 to £757; September 23, £756 10s. to £757 10s.; September 26, £751 10s. to £752; September 27, £748 10s. to £749; September 28, £751 10s. to £752.

LEAD—*Second half September*: September 22, £107 5s. to £107 7s. 6d.; September 23, £106 10s. to £107; September 26, £108 5s. to £108 10s.; September 27, £107 15s. to £108; September 28, £107 15s. to £108.

Second half December: September 22, £106 15s. to £107; September 23, £106 10s. to £106 15s.; September 26, £108 to £108 5s.; September 27, £107 15s. to £108; September 28, £107 10s. to £107 15s.

ZINC—*Second half September*: September 22, £92 5s. to £92 10s.; September 23, £92 to £92 5s.; September 26, £92 to £92 5s.; September 27, £91 10s. to £91 15s.; September 28, £91 10s. to £91 15s.

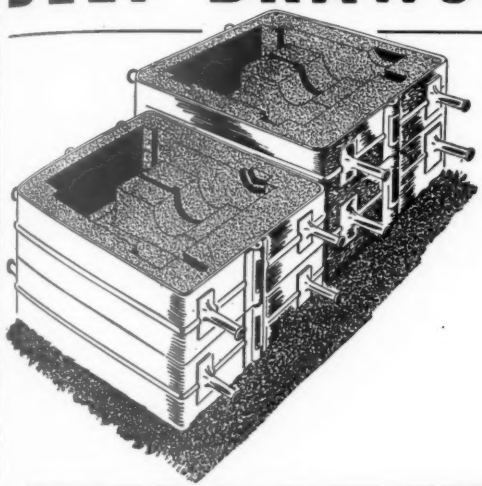
Second half December: September 22, £92 to £92 5s.; September 23, £91 12s. 6d. to £91 15s.; September 26, £91 15s. to £92; September 27, £91 10s. to £91 15s.; September 28, £91 10s. to £91 15s.

Tom Makemson Memorial

Members of the Institute of British Foundrymen are reminded of the appeal for subscriptions to the fund which is being established to found the Tom Makemson Memorial. It is estimated that at least £1,000 will be required to establish the Memorial, which will take the form of an annual award of a Tom Makemson bronze medal and prize to the best student in the final pattern-making examination of the City and Guilds of London Institute, whether or not such a student is a member of the Institute. Throughout his life Mr. Makemson maintained a keen interest in students and was associated with the work of organizing the City and Guilds examinations in Foundry Practice and Patternmaking from their inception, and it is felt that such a memorial will be particularly appropriate.

The Council of the Institute is anxious to close the appeal, which has perhaps been over-shadowed by the recent International Foundry Congress, during the present year, and members wishing to subscribe to the fund are requested to do so without delay. Subscriptions may be sent direct to the secretary of the Institute, or may be handed to branch secretaries during the opening meetings of the new session. Whilst it is hoped that those in a position to do so will subscribe substantially to the fund, it is emphasized that every subscription, however small, will be greatly appreciated.

DEEP DRAWS . . .



'FULBOND' increases plasticity and gives better draws —use 'FULBOND' and forget about lifters

For service and information write to:—

THE FULLERS' EARTH UNION LTD.

Patteson Court, Redhill, Surrey. Tel: Redhill 3521.

CMP.15

Leading Manufacturers of....

BRASS · MANGANESE BRONZE
GUNMETAL · PHOSPHOR BRONZE
AND LEAD BRONZE
produced to strict specification by laboratory and foundry control

CITY WALL HOUSE
FINSBURY PAVEMENT
LONDON E.C.2
Tel. METROPOLITAN 8831

WORKS:—
ST. STEPHEN'S STREET
ASTON
BIRMINGHAM 6
Tel. ASTON CROSS 3115

LEOPOLD LAZARUS
LIMITED

ON A.I.D. APPROVED LIST

CHRONICLE BUILDINGS
CORPORATION STREET
MANCHESTER 4
Tel. BLACKFRIARS 3741

POWELL D'IFFRYN
HOUSE
ADELAIDE STREET
SWANSEA
Tel. SWANSEA 4035

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

September 28, 1955

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £17 1s. 0d.; Birmingham, £16 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £18 12s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £19 8s. 3d.

Scotch Iron.—No. 3 foundry, £19 5s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £21 3s. 0d.; South Zone, £21 5s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £22 0s. 0d.; South Zone, £22 3s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £19 5s.; Scotland (Scotch iron), £19 11s. 6d.; Sheffield, £20 12s. 0d.; Birmingham, £20 19s. 6d.; Wales (Welsh iron), £19 11s. 6d.

Basic Pig-iron.—£16 16s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £43 15s. 0d., scale 15s. per unit; 75 per cent. Si, £65 0s. 0d., scale 16s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 11s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £230 0s. 0d.; 38/40 per cent., £279 0s. 0d.

Ferro-tungsten.—80/85 per cent., 18s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 21s. 7d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £84 0s. 0d. to £88 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £82 0s. 0d. to £86 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C* 1s. 11½d. per lb. Cr.; 1 per cent. C,* 2s. 0d. per lb. Cr; 0.15 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr; 0.10 per cent. C,* 1s. 11d. to 2s. 2d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £249 0s. 0d.; 96/98 per cent.. £269 0s. 0d.

Ferro-columbium.—60/75 per cent., Nb + Ta, 37s. per lb., Nb. + Ta.

Ferro-manganese (home).—78 per cent., £54 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £26 19s. 0d.; tested, 0.08 to 0.25 per cent. C, £27 19s. 0d.; hard (0.41 to 0.60 per cent. C), £29 5s. 6d.; silico-manganese, £36 7s. 6d.; free-cutting, £31 0s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £34 12s. 0d.; silico-manganese, £36 7s. 6d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £31 11s. 0d.; basic, hard, over 0.41 up to 0.60 per cent., C, £32 13s. 6d.; acid, up to 0.25 per cent. C, £35 12s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £33 1s. 6d.; boiler plates (N.-E. Coast), £35 11s. 6d.; floor plates (N.-E. Coast), £34 10s. 6d.; sectional material, N.-E. Coast, £30 19s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £33 19s. 6d.; flats, 5 in. wide and under, £33 19s. 6d.; hoop and strip, £35 1s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £36 5s. 0d.; black sheets (hand mill), 17/20 g., £46 13s. 6d.; galvanized corrugated sheets, 24 g., £58 11s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £58 0s. 3d.; nickel-chrome, £81 10s. 0d.; nickel-chrome-molybdenum, £92 7s. 6d.

NON-FERROUS METALS

Copper.—Cash, £374 0s. 0d. to £374 10s. 0d.; three months, £371 0s. 0d. to £371 10s. 0d.; settlement, £374 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 3s. 7½d. per lb.; rods, 419s. 6d. per cwt. basis; 20 s.w.g., 452s. 9d. per cwt.

Tin.—Cash, £751 0s. 0d. to £751 10s. 0d.; three months, £751 10s. 0d. to £752 0s. 0d.; settlement, £751 10s. 0d.

Lead (Refined Pig).—Second half September, £107 15s. 0d. to £108 0s. 0d.; second half December, £107 10s. 0d. to £107 15s. 0d.

Zinc.—Second half September, £91 10s. 0d. to £91 15s 0d.; second half December, £91 10s. 0d. to £91 15s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £123 10s. 0d.; rolled zinc (boiler plates), all English destinations, £121 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £103 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 10¾d. per lb.; rods drawn, 3s. 7¾d.; sheets to 10 w.g., 361s. 9d. per cwt.; wire, 3s. 5½d.; rolled metal, 347s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £230; B6 (85/15), —; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £288; HTB2 (38 tons), —; HTB3; (48 tons), —.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LG2 (85/5/5/5), £324; LG3 (86/7/5/2), £337; G1 (88/10/2/½), £397; (88/10/2/1), £392.

Phosphor Bronze.—BS1400, PB1 (AID released), £415 per ton.

Phosphor Bronze Strip, etc.—Strip, 508s. 3d. per cwt.; sheets to 10 w.g., 531s. 9d. per cwt.; wire, 5s. 1½d. per lb.; rods, 4s. 5¾d.; tubes, 4s. 4d.; chill cast bars: solids 4s. 6d., cored 4s. 7d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 4s. 4½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 8¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 7¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 4d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £92 0s. 0d. to £94 0s. 0d. Nickel, £519 0s. 0d. Aluminium, ingots, £171 0s. 0d.; aluminium bronze (BS1400), AB1, £364; AB2, £380; Solder, brazing, BS1845, 3s. 0½d. lb.; granulated, 3s. 4½d. lb.

Forthcoming Events

OCTOBER 4

Institute of British Foundrymen

Slough section:—"Cast Resin Patterns," by D. B. Orr, 7.30 p.m., in the Lecture Theatre, High Duty Alloys, Limited.

Incorporated Plant Engineers

London branch:—"Air-pollution Problems and their Cure," by J. B. M. Mason, 7 p.m., at the Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2.

Institution of Chemical Engineers and the Society of Instrument Technology, Limited

Joint conference on "Automatic Control in the Process Industries," at Caxton Hall, Westminster, London, S.W.1.

Institution of Works Managers

London branch:—Annual general meeting, followed by films on material handling, 6.45 for 7 p.m., at the Waldorf Hotel, Aldwych, W.C.2.

Leicester branch:—Annual dinner and discussion—"Are Lawyers Useful to Business?" by Sir Geoffrey Barnett, 7 p.m., at the Grand Hotel.

OCTOBER 5

Institution of Production Engineers

South Essex section:—"Training of Production Managers and Production Engineers," by G. S. Bosworth, M.A., 7.30 p.m., at the Mid-Essex Technical College, Chelmsford.

Incorporated Plant Engineers

Southern branch:—"Modern Trends in Heating and Ventilating," by Colonel Concannon, 7.30 p.m., at the Grand Hotel, Bournemouth.

OCTOBER 6

Northampton Polytechnic

"Constitution and Characteristics of Sand Grains and the Clay Bond," by Dr. J. E. Garside, 7 p.m., at the Department of Applied Chemistry, St. John Street, London, E.C.1.

Institution of Production Engineers

Reading section:—"Production Control as Applied to Small and Medium-size Companies," by F. T. Hunter, 7.30 p.m., at the Great Western Hotel.

Incorporated Plant Engineers

Merseyside and North Wales branch:—"Statutory Requirements in Connection with Boilers and Pressure Vessels," by G. A. Anderson, 7.15 p.m., at the Royal Institution, Colquitt Street, Liverpool.

Peterborough branch:—"Gas Turbines in Industry," by J. R. Needham, 7.30 p.m., at the Campbell Hotel, Bridge Street.

Institute of Industrial Supervisors

Rotherham section:—"Modern Foremanship," by R. J. Hall, 7.30 p.m., at Steel, Peech & Tozer, Limited.

OCTOBER 7

Institute of British Foundrymen

Bristol and West of England branch:—The branch are hosts for a series of works visits open to the whole membership of the Institute. Ten works will be visited. Evening: Dinner at the Grand Hotel. (Details from the secretary of the Institute.)

OCTOBER 8

Institute of British Foundrymen

West Riding of Yorkshire branch:—"Aluminium Founding," by R. Harrison, 6.30 p.m., at the Technical College, Bradford.

East Midlands branch:—"Cores and Moulds by the CO_2 Process," by A. Talbot, 6 p.m., at the College of Arts, Green Lane, Derby.

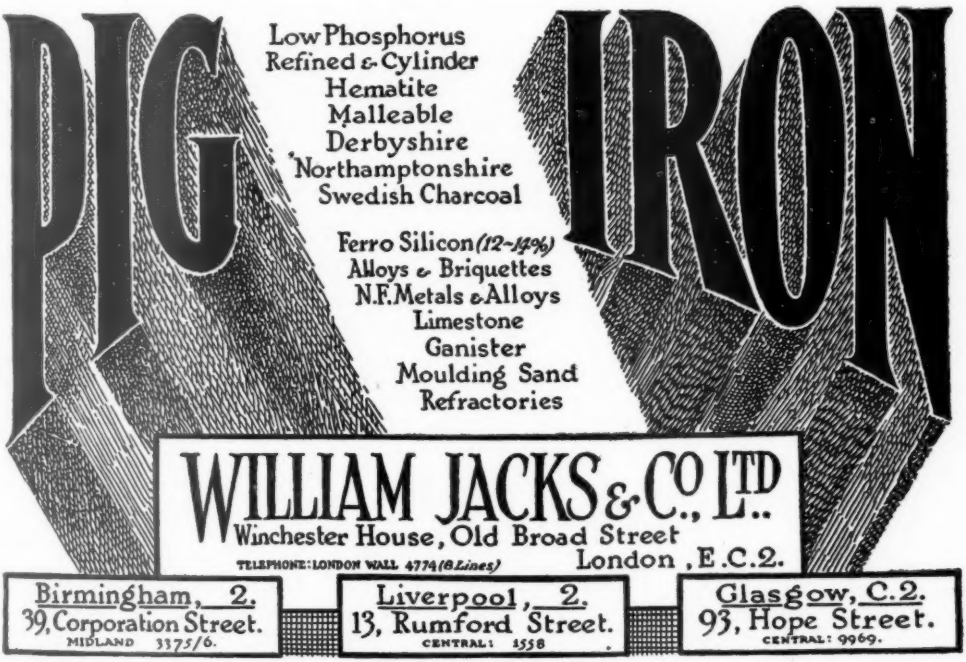
Wales and Monmouthshire branch:—"Foundry Problems and Principles," by G. J. Rogers, 6 p.m., at the Engineers' Institute, Cardiff.

Lancashire branch:—Presidential address by A. Kirkham, followed by "Behaviour of Moulding Sands at High Temperature," by W. B. Parkes, 3 p.m., at the Midland Hotel, Manchester.

Scottish branch:—Presidential address by J. M. Douglas, 3 p.m., at the Royal Technical College, Glasgow.

Institute of Industrial Supervisors

Glasgow section:—"Discipline under Full Employment," 7.30 p.m., at G. & J. Weir, Limited, Cathcart.



CLASSIFIED ADVERTISEMENTS

PREPAID RATES: Fifteen words for 7/6 (minimum charge) and 4d. per word thereafter. Box Numbers 2/6 extra (including postage of replies.) Situations Wanted 2d. per word.

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

MANAGER desires post with progressive Foundry. Fully experienced practical man, technical and commercial. Production planning, layout design, organisation of jobbing repetition and mechanised foundries, producing automobile, diesel engine, electrical and general engineering castings. Accustomed to full control and handling all classes of labour.—Box MD519, FOUNDRY TRADE JOURNAL.

BUYER, with large concern Ironfounders and Vitreous Enamellers, seeks change. Wide experience of trade. Ability to negotiate contracts and schedule materials. Excellent credentials.—Box BW531, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER/FOREMAN, 41, A.M.I.B.F., desires post South Yorkshire Area preferred. Box FM536, FOUNDRY TRADE JOURNAL.

EXPERIENCED CHARGEHAND and GENERAL MOULDER, desires supervisory position. Fully experienced in floor and mechanised moulding in ferrous and non-ferrous metals. Any area considered. Box EC537, FOUNDRY TRADE JOURNAL.

FOUNDRY WORKS MANAGER (42) M.I.B.F. seeks change, 16 years Managerial experience in Machine Tools, Textile and Light Castings for the Domestic Trades; Machine Shop and Light Assembly; Vitreous Enamelling of cast iron. Excellent Industrial record. Representation considered. Box FW499, FOUNDRY TRADE JOURNAL.

MECHANICAL ENGINEER, 30, A.M.I.Mech.E., A.M.I.B.F. Engineering College education, seeks responsible position with progressive company as SALES ENGINEER, material handling plant or foundry equipment. Midland area; car essential. Box ME514.

FOUNDRY MANAGER seeks new top level appointment. 16 years' managerial experience in modern methods of production. Floor, machine and shell moulding in grey, high duty and special irons. Good background and qualifications.—Box FM524, FOUNDRY TRADE JOURNAL.

PATTERNSHOP SUPERINTENDENT (36), A.M.I.B.F., seeks position with progressive company. 20 years' experience of wood and metal patternmaking. Costing and layout design. Sound knowledge of all foundry departments engaged in the production of iron and non-ferrous castings by floor, machine and shell moulding. Any district, providing post offers scope for advancement after proven ability. Box PS541, FOUNDRY TRADE JOURNAL.

SALES EXECUTIVE requires appointment, with increased scope and prospects. Excellent contacts in the Casting field.—Box SE525, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order,* 1952.

SITUATIONS VACANT—*contd.*

RADIOGRAPHER required as Assistant in Shipbuilding and Radiographic Department. Previous experience desirable but not essential as training can be given to applicant with suitable scientific background. Minimum educational requirement is the General Certificate of Education and the age range between 20 and 30. Replies should be addressed to LABOUR MANAGER, Vickers-Armstrongs (Engineers) Limited, Barrow-in-Furness, Lancashire.

OLD - ESTABLISHED Birmingham Company requires ASSISTANT FOUNDRY FOREMAN. Maximum age 35. Must have served Non-ferrous Moulding apprenticeship. Permanent, pensionable and secure position for suitable applicant. Fares paid for interview. State age, trade qualifications, and practical experience. — Box O.E.502, FOUNDRY TRADE JOURNAL.

TECHNICAL SALES REPRESENTATIVE required by an expanding division of an East Midland Engineering Firm entering the Foundry Plant and Machinery field, to guide development as well as taking full responsibility for sales. Candidates should have wide sales experience, preferably including shell moulding and other modern techniques. The appointment will carry a salary appropriate to the qualifications and experience of the man chosen. The Company provide excellent conditions of employment, Pension Scheme, etc. Applications, which will be treated confidentially, should include details of age, qualifications and previous experience, including salaries earned, and should be addressed to PERSONNEL MANAGER, Box TS482, FOUNDRY TRADE JOURNAL.

SECTION LEADER/DRAUGHTSMAN required with practical knowledge of Servo electronics, pneumatic and other mechanical devices as applied to Gravity Die Castings and Coremaking machines.

This is a Staff appointment and will classify for Pension Scheme.

Apply in writing to the CHIEF DRAUGHTSMAN, Vowles Aluminium Foundry Company, Limited, Bank Street, West Bromwich.

NON - FERROUS FOUNDRY MANAGER (Directorship later) required, preferably experienced technically and commercially in centrifugal casting. Exceptional remuneration and an interest in financial results.—Apply in confidence, CHAIRMAN, Metals & Alloys, Ltd., Minworth, Birmingham.

FOREMAN DRESSER required for a Steel Foundry in South Wales. Reply giving full particulars of experience, age and remuneration required to BROWN LENOX & Co., LTD., Pontypridd Glam.; reference A.G.G.

CHIEF METALLURGIST required for Mechanised Grey Ironfoundry producing 160 tons per week of small/medium grey and high duty iron castings. The position carries full responsibility for the control of laboratory, metals, sands and their processing; is a senior staff appointment with commensurate salary (£1,000—£1,200) bonus, and pension.—Box CM534, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

PATTERNMAKERS required. Permanency. Experienced in wood and metal by small master shop in South-West London.—Box PR521, FOUNDRY TRADE JOURNAL.

DRAUGHTSMEN required, preferably with Gravity Die experience. First class jig and tool draughtsmen wishing to broaden experience might suit. Pension Scheme in operation. Apply JOHN DALE LTD., London Colney, Herts.

QUALIFIED METALLURGICAL CHEMIST required to take charge of Foundry Laboratory. Practical experience of Grey Iron Foundries essential. Knowledge of chilled iron processes desirable. Write stating age, experience and salary required to PERSONNEL OFFICER, E. R. & F. Turner, Ltd., Ipswich.

OLD Established Non-Ferrous Ingot Metal Manufacturers require experienced TRAVELLER for London and Home Counties, with established connection. Knowledge of buying scrap an advantage. Applications treated in strict confidence to Box OE533, FOUNDRY TRADE JOURNAL.

MILLBROOK ENGINEERING COMPANY, Landore, Swansea, requires METALLURGIST with experience in casting of Chilled Cast Iron and/or Alloy Rolls. Age 35/45. Pension scheme.

FOREMAN required for Mechanised Malleable Foundry in West Midlands (25/35). Applicant must have organising experience and ability to control labour, knowledge of malleable preferable, but not essential. Real opportunity for keen technically trained man.—Write, giving full particulars and salary expected, Box FR532, FOUNDRY TRADE JOURNAL.

SENIOR FOUNDRY FOREMAN, with experience in control of floor-moulders, required for grey-iron foundry, E. Scotland. Machine Tools and general engineering castings. Apply giving particulars of experience to SF885, FOUNDRY TRADE JOURNAL.

TURTON BROS. & MATTHEWS, LTD.,

Sheffield,

will shortly have a vacancy for

A MANAGER

of their Steel Department.

The post involves control of high frequency melting plant, progressing of all grades of tool steel through hire forges and rolling mills and the supervision of a small foundry producing alloy steel castings using shell moulding and carbon-dioxide technique.

Apply in writing, stating experience and salary required, to THE SECRETARY, G.P.O. Box 40, Sheffield.